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Reciprocity—the Manufacturer and the Monopolist.

At a meeting of manufacturers convened in New York to select delegates to the coming Reciprocity Convention to be held in Washington the following resolution was adopted as the sense of the meeting:

"We favor the associated policy of reciprocity so directed as to open our markets on favorable terms for what we do not produce in return for free foreign markets."

This is supposed to "favor reciprocity." But if the sentiment of the Reciprocity Convention is at all like that of the convention of manufacturers held at Detroit last spring, delegates that go there representing any such lame and halting endorsement of the principle of reciprocity as is expressed by the resolution quoted will find themselves swept off their feet. The plain and insistent demand of the manufacturers who spoke at Detroit was not for some careful and timid tinkering with the tariff on the few things that we do not or cannot produce, but for a substantial reduction and in some cases for the absolute repeal of duties on things which we do make and make in large quantities. Not simply a few, but literally dozens, of the most prominent manufacturers of the country declared with emphasis either that the protective tariff business had been overdone or that they had outgrown it and would now be better off without it. And particularly did they declare that they would be much better situated for conducting foreign business if their raw materials were made free; as was the case with hides during the time that the New England shoe-manufacturing business was being developed and until within a few years ago, when a lobby operating in the interest of the Chicago packers prevailed upon Congress to impose a duty upon hides.

There is plenty of evidence that manufacturers as such are coming to more clearly see the essential difference between their business and that of the monopolies, and this is a wholesome thing. We have before pointed out the fact that the term "monopoly" is far too loosely applied and that manufacturers whose business is in no sense monopolistic are too willing to be classed as monopolists in cases where the only basis for the charge is that the business is carried on by large corporations owning a number or perhaps a majority of the manufacturing plants devoted to their line of industry.

In order to clearly appreciate the difference between the real monopolists and manufacturers whose business is competitive it is only necessary to consider for a moment the testimony of Charles M. Schwab before the Industrial Commission at Washington. This testimony did not of course show that the United States Steel Corporation is nothing more than a monopoly, because, as a matter of fact, it possesses a dual nature and is a manufacturing corporation as well as a giant monopoly; but it is its monopoly which gives it its power and imparts the value to its stock upon which the rest of the people of the country are required to pay dividends. This is not merely our assertion; it is proven by the testimony of the organization's president. Listen to Mr. Schwab.

Asked if he would, in his bookkeeping, "assume higher prices for ore when there is a strong demand for the finished product," he replied:

"As to ore this is fair: There is a known quantity of ores in the United States, and as far as the best geologists can determine this ore region is not likely to be extended. Now, I think it is perfectly fair for the United States Steel Corporation, in view of this fact and knowing that they own a given tonnage of ore which can be very closely estimated, to fix a liberal price upon that ore, because in years to come it is going to be very valuable, exceedingly valuable."

"Would you vary the price of ore with the demand for your finished products?"

"No, we would not. We might charge it in for the purpose of reducing our profits. We ought to fix the price that we think the ore is worth. That is the basis of it all. If we fix a price for ores it ought to be maintained under all conditions, and then, whether we take our profit on the ore and lose it on the steel, it would not make any difference. But the value of these plants has been much underestimated by people who cannot appreciate the limited quantity of raw material that is available in the United States, or the world for that matter, for the manufacture of steel. For example, England thought years ago that she had an unlimited supply of raw material, and her manufacturers went ahead using it. To-day the manufacture of steel in England is largely a question of procuring raw material. They did not place nearly a high enough estimate on the value of materials which they had in England, and now they are going to Spain and Sweden and even taking some ores from America. That ought to show the value of the ore deposit which we have in America; and I am constantly talking to our people about putting a sufficiently high valuation upon them, because at the rate they are now being used they will not last many years."

When discussing the question of capitalization and whether or not the stocks of the great trust were not all water—the tangible assets being entirely covered by the $34,000,000 of bonds, he said:

"That is entirely a question as to the valuation you put upon your raw material resources. If I were putting the raw materials into this capitalization it would not be big enough. I claim that our ore and coking coals, limestone, etc., are of much more value than people, as a rule, have ever given to them. For example, this company has over 500,000,000 tons of ore in sight in the Northwest. Now, it does not take many dollars per ton on that ore alone to equal the capitalization of these concerns. We own something like 60,000 acres of Connellsville coal. You could not buy it for $60,000 an acre, for there is no more Connellsville coal. If the consumption of steel increases in the future as it has in the past, I believe the Connellsville coal will be exhausted in thirty years. If the consumption of ore in the Northwest goes on as it has in the past, it will not last very long, perhaps sixty years. Of course there are other coals, but it is a well-known fact that the Connellsville coking coal is an

ideal coal for manufacturing purposes. Now, this coal field is very clearly defined and every acre of it is highly prized, and it is owned by these constituent companies in toto. There may be developments of coal in other directions, but nothing like this coal; therefore I say the matter of capitalization depends very largely on the value you put on raw material."

He said that "these companies . . . have created values by coming together, and the owning of these stocks by one corporation will enhance the value of them all." He said that while iron and coal mines were usually put in at the outset at cost, and were carried on their books at low valuations, yet "if they appreciated in value by reason of the fact that a limit could be placed upon the possible sources of supply they certainly would possess a higher value if considered at subsequent periods."

Nothing could possibly be plainer than this testimony as to what it is that gives value to the stocks of the United States Steel Corporation. It is not because that organization is superior as a manufacturer nor because it is able to introduce the wonderful economies of production that we hear so much about; but simply and solely, according to the testimony of the man who ought to know all about it, because it has secured the legal right to charge the American people whatever it chooses for coal and iron ore—as though these necessities of modern existence were placed in the earth by the Creator for its exclusive use.

The manufacturer of machinery, or anything else, no matter how much capital he may employ, nor how many manufacturing plants he may own or operate, who imagines himself to be in the same class with a monopoly of this kind is entirely mistaken and not only that but he should take pains, in reciprocity conventions and everywhere else, to draw the distinction and induce others to do it. Not only is it true that the manufacturer as such does not share in such monopolies, but he is the victim of them. Mr. Schwab testified at the same time that "export prices are made at a very much lower rate than those for domestic consumption," and it is generally understood that it is the policy of his company to lower prices in foreign markets wherever it is necessary to do so in order to secure business; which means nothing else than that American builders of machinery are to be made to pay a higher price for steel than their foreign competitors pay for exactly the same American steel. The United States Steel Corporation does this because it is a monopoly, not because it is a large manufacturer.

Adaptation to Customers vs. a Standard Line of Machinery.

We have been seeing a good deal in our English exchanges, and occasionally at home as well, about the willingness of German manufacturers to meet the views of their customers and to adapt themselves to the requirements or ideas of the customers to whom they seek to sell. A man connected with a large electrical establishment in Germany said the other day in discussing this matter that he thought this had gone too far in electrical machinery; that they had been too ready to conform to the ideas of customers with the result that they had a very large assortment of machines for which they had drawings, patterns, etc., but had no standard line such as is common in this country and which will permit the use of the most approved and efficient methods of manufacture that can be applied only where there is a fixed standard which is not departed from. He said that it was the intention of the concern he is connected with to correct this and to design a standard line of machines which would not be departed from except possibly in case of a very large order where it would pay to do it for the one order in itself and without regard to the possibility of future business in similar machines.

It is needless to point out that this experience is directly in line with the experience of a number of firms here in America, which experience has led to the conclusion which we find so firmly fixed in the minds of many machine builders; that conclusion being that the only way to make money out of the machine business is to design a machine which is believed to be the best possible compromise between the different ideas or requirements of the various customers, and then make that machine and nothing else; the lower price at which it can be supplied being usually a sufficient inducement to overcome the minor objections that may be made to it by a portion of its users.

Failure to Pay Wages Promptly.

A subscriber, who says he writes on behalf of himself and many other toolmakers, asks us what can be done in relation to the troubles they are experiencing in a certain automobile works located in the State of New York. He says they are falling behind in the payment of wages and though he mentions other things that are not satisfactory this failure to pay wages promptly or fully is evidently the chief grievance. He asks us to investigate this matter and to fix it up, for which he promises us the thanks of our readers.

Of course we are glad to earn or to receive the thanks of our readers in any way we can, and it is hardly necessary to say also that we think workmen's wages should be promptly paid whenever it is possible, but it is not likely that this company is voluntarily withholding the wages of the employees. That is about the last thing that a manufacturing concern will do, they being most always more anxious to pay wages promptly than any other obligation. There is a law in the State of New York which requires the payment of wages to be made within certain specified periods, but, as we understand the matter, there is no penalty attached for not doing this, but it only makes it possible for workmen to collect within that period if they choose to do so. Usually where payment of wages in full is not made or payments are behind, it is by tacit or expressed agreement between employers and workmen, and we cannot interfere in such matters. We have no right to demand of a manufacturer that he shall pay his men promptly and do not see how we are in a position to improve such a state of affairs. Of course, we would do it if we could, but there is no way of doing it that is open to us.

American Exhibition in London.

An exhibition of American products is to be held in the Crystal Palace, London, from May to September, 1902. The time will be favorable for such an event owing to the crowds that will be drawn together in June if the coronation takes place then as arranged for. The Crystal Palace, of which the buildings now cover about sixteen acres, was the scene, it may be remembered, of the first great international exhibition, 1851.

The chairman of the American advisory committee of the show next year is J. Morgan Richards, and among the members appear the names of Charles Churchill and Wm. J. Clark. The English advisory committee includes the Lord Mayor of London, Earl Grey, Earl of Crewe, Sir Henry Irving, Winston Churchill, and others.

Class I of the exhibits is that of machinery and the mechanical industry. It is subdivided as follows

(a) Mining, agricultural, printing, electrical, traction, haulage, etc.

(b) Shipbuilding, locomotives, railway and tramway engineering and equipment.

(c) Automobiles, bicycles, typewriters, sewing machines, laundry, domestic and other labor-saving appliances, etc.

(d) Hardware, tools and cutlery.

In connection with the exhibition it is proposed to establish, under the direction of a committee of representative American and British firms, a commercial bureau, so that all necessary information may be supplied to exhibitors with regard to channels of trade and the placing of goods upon the British and Continental markets.

Plans and particulars of space—the charges for which range from 4s. to 20s. per square foot, according to position—will be forwarded on application to W. B. Bancroft, Assistant-Commissioner for Commercial Section, 20 Victoria street, London, S. W., or to Henry Gillman, General Manager, Crystal Palace, S. E. The forwarding agents in America are the Anglo-Saxon Shipping Company, Produce Exchange, New York, and Grand Central Station, Chicago.

Perhaps it should be added that the word "American" as used in connection with this exhibition appears to be restricted to the United States.

Commercial Review.

NEW YORK, Monday, Nov. 11.

ENGINE MARKET AND OTHER NOTES.

Among the remarks of representatives of the engine and boiler trade in this city a frequent and it may fairly be said the characteristic report is that of great activity. Business from some points of view has been increasingly active in the last few weeks. In certain quarters, however, there is a discordant note of complaint that inquiry is less than hitherto, as though the jumping-off place of trade were in sight. One indication of this is the greater eagerness of people to get business. Daily mails, observes one seller, are unusually heavy, but their weight consists of circulars sent around in an attempt to drum up orders for all sorts of mechanical appliances. The agent referred to had consequently begun to get a little pessimistic about the future of trade, forming his opinion from the standpoint of the New York office. When, however, he took a trip out to the home works—a very large engine and boiler plant in the middle West—he found reason to reverse his conclusions completely. He has returned an unwavering optimist as to the insuppressible energy of the present industrial boom. The works on Saturday, he found, were destitute of the coke needed for Monday's work and little prospect of getting any, because of the shortage of cars. This car famine which is causing the best laid plans of industrials to "gang agley" is a fair criterion of the magnitude of operations, and is the more significant from the fact that the corn crop has been far from a heavy one. The recent order by the Pennsylvania Railroad of some 13,000 steel cars indicates the confidence that organization must feel in the future. The country's supply of rails, moreover, is said to be sold out for three-quarters of the year 1902. Our friend above alluded to is of opinion that the manufacturing activity of the country is fast tending westward. This does not agree with an opinion heard elsewhere that there is disposition on the part of factories to get as near as possible to New York city.

A new feature of business related to the local electrical and steam-engineering trades which has been brought up in comment is characteristic of modern industrial tendencies. This is the disposition of general contractors for city buildings to buy equipment, etc., directly of the manufacturers and fill in the odds and ends of work themselves, rather than through intermediate sub-contractors. The lead in such a policy has been taken, it is stated, by one important firm, and another firm is inclined to pursue a similar one. Under the new method, instead of allotting the entire electrical contract, for instance, to a subcontractor who will attend to its several subdivisions, such as ordering the generators and the wiring, the general contractors will buy the generators directly and will themselves do all the work that is to be done on the premises. This is an example of the consolidation principle applied in the building trade. Only a concern of considerable magnitude could fully carry out the system. The one which is initiating it is said to have on hand contracts for local office building work amounting to $25,000,000.

The Cincinnati Milling Machine Company, Cincinnati, made an export shipment of milling machines on the 26th of last month which was notable for the number of points of destination to which the goods were sent. In this single shipment were included machines for Manchester, Liverpool and London, England; Brussels, Berlin, Vienna, St. Petersburg, Paris and Japan. The company is therefore of opinion that the foreign demand in some lines of machine tools is considerably alive.

The Wais & Roos Punch & Shear Company has under the laws of the State of Ohio changed its name to the Cincinnati Punch & Shear Company. Otherwise the organization remains the same. Christ. Wais is no longer connected with the concern, but has embarked in a separate enterprise which we have previously mentioned.

The American Foundry & Machine Company, Hanover, York Co., Pa., has taken a plant at Glenville in the same county, including a machine shop and foundry, and has it in running shape with fifty hands employed. This plant will be run as an adjunct to its new plant in Hanover, which it will have ready for occupancy April 1, and it expects to run a considerable number of machinists, as well as foundrymen on high-grade work. The foundry will be a commercial one, but special attention will be paid to machine-tool castings and high-grade work. A considerable number of machine tools will have to be bought, as well as crane equipments, etc. The company will be incorporated shortly under the laws of Pennsylvania with $100,000 capital. The particular line to be followed in the machine shop has not definitely been determined, but it will probably be machine tools.

The shipbuilding industry does not appear to be flourishing quite as luxuriantly as was the case a year ago. Nevertheless it is reported that a new $5,000,000 shipyard is to be established at Norfolk (Va.) harbor. It is said that ex-Governor Atkinson and State Treasurer Silverman, of West Virginia, together with other capitalists from that State, are interested and that the matter has progressed so far as the opening of bids for construction.

Elliott C. Smith and Frank P. Holran, purchasers of the plant and property of the old Rogers Locomotive Company, at Paterson, N. J., have organized a new corporation. It will be known as the Rogers Locomotive Works, and will have for president John Havron, who was for a long time identified with the Rogers company. The capital stock is $1,600,000. It is said that the company will turn out 1,200 locomotives a year and has already received orders from the Pennsylvania, the St. Louis Southwestern and the Erie roads, as well as from Japan.

The American Woodworking Machinery Company has been organized at Williamsport, Pa., with a capital of $1,500,000. It is a reorganization of the old company by the bondholders.

The rumor that the Westinghouse Electric & Manufacturing Company is to build a manufacturing plant at Little Falls, Minn., has been discredited.

Bids will be opened November 26 at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for delivering the following machinery, etc., at the Navy Yard, Puget Sound, Wash.: 100 horse-power boiler, duplex feed pump, surface condenser, 32-kilowatt generating set, 15 horse-power motor, two 5 horse-power motors, 32-inch swing engine lathe, 12-inch swing toolroom lathe, back geared turret lathe, 16-inch swing engine lathe, hand speed lathe, universal milling machine, 24-inch pillar shaper, open side planer, drill press, sensitive three-spindle drill press, universal grinding machine with attachments, 24-inch water tool grinder, polishing and buffing lathe, grinding stone, trough and frame; portable pipe threading machine, patternmaker's lathe, electrical and other instruments, tools, mechanics' clamps, lathe dogs, lathe tools, hand chasers, reamers, drills, files, etc.

Indicative of the general prosperity of manufacturing industries is the demand for drawing instruments. Theodore Alteneder & Sons, of Philadelphia, report that their facilities are pushed to the utmost to supply the demand, as they have been continuously for the past three years. It is also gratifying to know that this firm has built up a flourishing export business. Their instruments go in large numbers to England, and especially to the Scotch shipyards, and another country in which there is a steady demand for them is Denmark. A peculiar feature of the trade is the fact that during the war in South Africa several consignments have been sent there for the use of the British military engineers. This firm has done business regularly with Canada, Mexico and South America for many years, but the trade with Europe and South Africa is of more recent origin. The Scotch shipyard trade started through knowledge of the instruments obtained by Scotch ship draftsmen who have been employed in American shipyards but who have since returned home, and the South African trade has sprung from the instruments forming the personal kits of the American engineers who found employment there before the war began. Practically all of the foreign trade had its origin in similar ways and entirely without active effort on the part of the firm. American draftsmen have a feeling of personal pride in these instruments and will

be gratified to know that their merit is being substantially recognized elsewhere.

FOR CHANGES IN THE BANKRUPTCY LAW.

The National Association of Credit Men, 20 Nassau street, New York, has issued a reprint of an article which appeared in the April "North American Review" by William H. Hotchkiss, on the Federal Bankruptcy law. His argument is that while the law, as it stands, is defective, it should neither be repealed or made intermittent in operation, but should be amended. The recommendations in this direction made by various legal and commercial bodies, including the one above named, are at present directed to the accomplishment of three objects: (1) making it more difficult to obtain discharges, at least to shut the door on shady and chronic bankrupts; (2) widening the law so as to include corporations within its voluntary features, as well as to prevent those friendly receiverships which are frequent sources of injustice to creditors now; and (3) changing the law so as to meet the decisions concerning jurisdiction of suits and so-called innocent preferences. Many also advise the increase of the fees of the trustee and referee; others would secure a specific enactment that alimony and like obligations are not dischargeable; while the American Bar Association would have any debtor who substantially diminishes his property by gambling, speculation or reckless management of his business adjudged a bankrupt on the instance of his creditors. Mr. Hotchkiss advocates further that the present system of administration through referees' courts be changed. He also remarks that there is agitation for a bankruptcy treaty between England and ourselves.

We are notified that a special committee on the Bankruptcy act for the suggestion of amendments has just been appointed by the Merchants' Association of New York.

NOTES ON FOREIGN DEALINGS.

That the proposed German tariff, if it goes into effect, is likely to have disastrous consequences to the German factory working population is shown in a report from Consul Kehl at Stettin. The first effect of an increase over the present import duty on foodstuffs coming into the Empire, he says, will be an advance in the price of these articles. The cost of living in Germany at present is from 10 to 50 per cent. higher than in the United States, while wages are about one-third those paid in America. To balance the increased cost of living, wages must be increased, which again will enhance the cost of producton and the selling price, thus placing the burden of a higher import duty on the people in general.

The French Chamber of Commerce at Madrid reports that while the outlook for machinery at that place is restricted there are good prospects for the sale of electric motors. This is because (1) the population is increasing and hence small industries are developing; (2) the satisfactory results of large electrical plants that have been installed have led capitalists to consider the development of waterfalls, with further ones which bid fair, if carried out, to lower the price of the current so as to favor the use of motors. The Germans, English, Swiss and Belgians, but especially the Germans, are working into the market. Customers are generally willing to order by catalog and wait for the goods in order to get something that suits them. Price is a consideration secondary to a satisfactory article. There must, however, be a sample stock to begin with, and the manufacturer has to take some risk.

CHICAGO MACHINERY MARKET.

The electrical equipment of railroad shops continues an active feature of the Western market. A few days ago the Michigan Central road awarded to the George B. Swift Company, general contractors, of this city, the contract for the construction of new shops at Jackson, Mich. The work is an addition to present shops, there located, and the purpose is said to be to equip electrically both old and new shops. Plans for this equipment have been prepared by C. H. Wilmerding, consulting engineer, and the contract for generators and dynamos has been let to the General Electric Company. Before this appears in print the award for the electrical equipment of the Union Pacific shops at Omaha and at Pocatello, Idaho, will probably have been made. The Santa Fé road has inquiries out for a $100,000 equipment of the shops at Topeka, which it is expected will be let soon. The Chicago, Burlington & Quincy road is inquiring for electrical machinery for new shops to be erected in the Black Hills, this improvement to depend, however, somewhat upon the consummation of the big railroad deals recently under consideration. The St. Paul road also has asked for motors for the Milwaukee shops.

Representatives of electrical machinery builders explain the large amount of business in sight by the statement that manufacturers are everywhere looking more closely than ever before to the cost of production, and say that present activity will probably continue unchecked for years. It is common for the machinery builders to be enlarging their shops and increasing output. The improvements at the shops of the Northern Electrical Mfg. Company, Madison, Wis., will not be completed for three months, but capacity will then be doubled. The new factory of the Milwaukee Electric Company, to be ready for occupancy in January or February, will treble or quadruple their output. Both these makers are said to be turning down more business than they can accept. Current trade includes, besides home orders, a fair percentage of foreign business.

The L. Wolff Manufacturing Company, Chicago, has just purchased another generator of 100 kilowatts from the Northern Electrical Manufacturing Company, supplementing their previous order of a 200-kilowatt generator from the same makers. F. E. Myers & Brother, Ashland, Ohio, have bought from the Sprague Electric Company two 125 horse-power generators, supplementary to a previous order. Much of the current trade consists of additional equipments like these.

The Ironton Portland Cement Company, Ironton, Ohio, have asked for bids for an electrical equipment to consist of 750 horse-power generators and motors to correspond.

Ordinarily deliveries possible do not satisfy the purchaser and the possessor of second-hand outfits has a ready market for all the machinery he can find.

The Standard Pneumatic Tool Company has removed its general offices from Chicago to its new works at Aurora, Ill., where all correspondence should be addressed. Its present quarters have proved inadequate owing to the unprecedented increase in the sales of "Little Giant" pneumatic tools during the past few months. It has greatly increased its facilities for manufacturing, which will enable it to fill all orders for machines promptly in the future.

Quotations.

NEW YORK, Monday, Nov. 11.

Pennsylvania Foundry Pig Irons, Jersey City delivery:

No. 1 X	$15 40 @ $16 40
No. 2 X	14 90 @ 15 65
No. 2 plain	14 15 @ 14 65
Gray forge	13 90 @ 14 25

Alabama Pig, New York delivery:

No. 1 foundry, or soft	15 50 @ 15 75
No. 2 foundry, or soft	14 75 @ 15 00
No. 3 foundry	14 25 @ 14 50
Foundry forge, or No. 4	13 75 @ 14 00

It might be difficult to obtain pig iron at the lowest figures named on some grades.

Bar Iron—Base sizes—Refined brands, mill price on dock, 1.68c. in carload lots. From store, 1.90 @ 1.95c. in small lots.

Tool Steel—Base sizes—Good standard quality, 7c.; extra grades, 10c. and upward.

Machinery Steel—Base sizes—1.90 @ 2.00c. from store.

Cold Rolled Steel Shafting—Base sizes—From store, 2¼ @ 2½c.

Copper—Lake Superior ingot, spot, 16¾ @ 17c.; electrolytic, 16½ @ 16⅝c.; casting, 16 @ 16¼c.

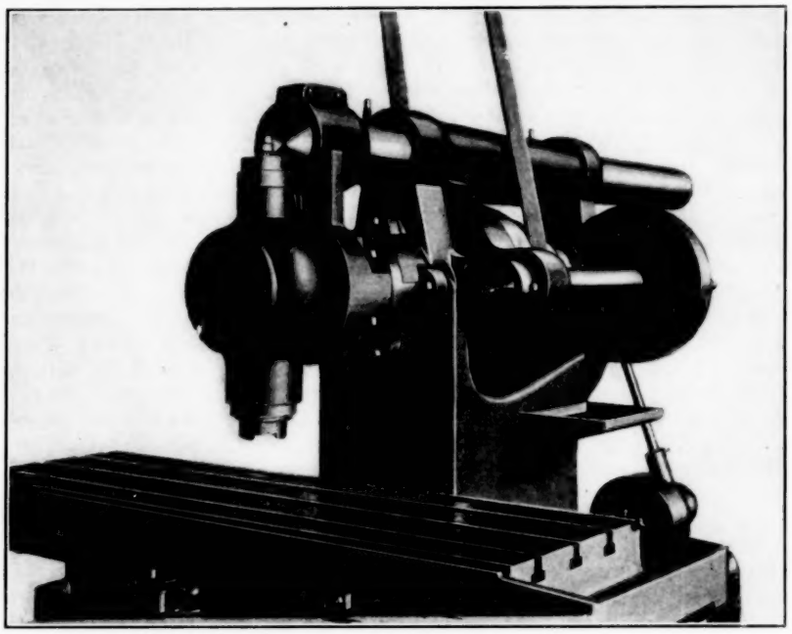
Pig Tin—In 5 and 10-ton lots f. o. b., New York, 24¾c.

Pig Lead—For wholesale lots, 4⅜c., with .02½ @ .05c. extra for carloads.

Spelter—4.30c., New York delivery.

Antimony—Cookson's, 10¼ @ 10⅜c.; Hallett's, 8¼ @ 8⅜c.; Italian, 7¾ @ 8c.

Lard Oil—Prime City, 71 @ 72c., in wholesale lots.



VERTICAL SPINDLE MILLING HEAD FOR CINCINNATI MILLER.

New Vertical Spindle Milling Head.

We show herewith a photograph and detail section drawing of a new vertical spindle milling head for use on heavy knee-type milling machines. The photograph shows the head attached to a machine. The drawing, which is a section on a vertical plane through the horizontal and vertical spindles, shows the construction and size, and is self-explanatory. The head can be swiveled in a vertical plane through 360 degrees. The circle bearing the graduations is divided into degrees and is 8⅝ inches in diameter, so that graduations are readily seen and accurately set. The cutter shanks are clutched to the spindle, as shown, so that this takes the place of the usual tang on the end of shanks. In this case the ends of the shanks are tapped ⅝′-11, to fit the bolt shown and by which they are firmly secured. The bolt is provided with a shoulder near its head, so it can be used for backing a shank out as well as for drawing it in.

The attachment is made by the Cincinnati Milling Machine Company, and is especially designed for use on their No. 3 and No. 4 machines.

Spiral Gears—I.

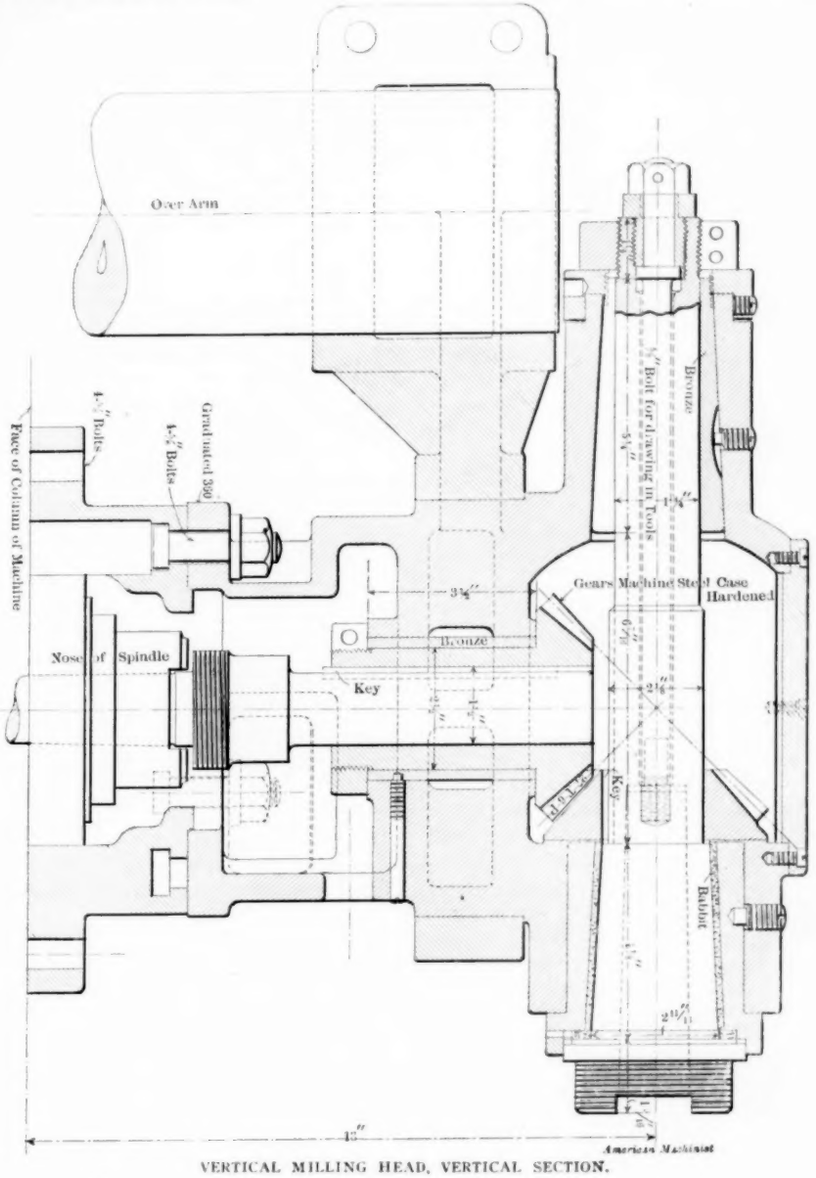
BY F. A. HALSEY.

SPIRAL GEARS COMPARED WITH SPUR GEARS—THE DIFFERENT PITCHES.

The following article may not be essentially any clearer than those which have already been published in these columns, but it presents the subject from a somewhat different standpoint and with greater fullness of illustration, and it may thus assist some in obtaining a comprehensive idea of just what the spiral-gearing problem is.

Spiral gears are not to blame for the undoubted fact that they are somewhat troublesome to lay out, the difficulties of the problem being due to the limitations of workshop facilities and not to the geometrical nature of the gears themselves. It is easy to understand and explain the action of an existing pair of spiral gears. More than this it is easy to lay out a pair of such gears which shall exactly meet all the conditions of the case except one—they cannot, except through rare good luck, be made with the appliances at hand. To be more specific, the circumference cannot usually be divided into an exact whole number of teeth by any stock cutter, and the real problem becomes the readjusting of the diameters of the gears and the angle of the teeth, so that stock cutters shall make an exact whole number of teeth.

With spur gears it is only necessary to multiply the (circumferential) pitch of the cutter by the number of teeth to be cut to obtain the circumference of the gears. With spiral gears this operation gives the length of a portion of a spiral, or, more properly, helix, wound upon the pitch surface. We do not know the angle of this



VERTICAL MILLING HEAD, VERTICAL SECTION.

helix, the diameter of the pitch cylinder upon which it is wrapped or even what part of a complete turn the known portion comprises. The length is known for each gear and nothing more, and it becomes a matter of trial to find the diameters of the gears and the helix angle to suit this portion of the helix and at the same time fill the required center distance.

Fig. 1 is a conventional representation of the pitch surface of a spiral gear, the surface being extended beyond the limits of the gear in order that the two helixes with which we are concerned may be shown. The first of these, *a b c d e f*, is the tooth helix and the second, *a g h d i p*, is the normal helix. The tooth helix is of importance because it defines the angle of the teeth. Given the diameter of the pitch surface, the helix may be defined by the angle *k a l* or by the length *a f*, in which it makes a complete turn—that is, by its pitch. For the determination of the speed ratio of a pair of gears the former method is the more convenient, but the tables supplied with universal milling machines which are used in setting up the machine employ the latter method.

In all spiral gear problems we have too pitches to deal with—the pitch of the tooth helix and the pitch of the teeth. The latter may be measured in several ways. First is the value *a n*, measured on the circumference or the *circumferential pitch*, which is analogous to the pitch of spur gears; second is the value *a o* measured on the normal helix or the *normal pitch*, for which the cutters must be selected; third is the value *a r* measured parallel with the axis or *axial pitch*.* Since the cutters must be selected with reference to the normal pitch the length of the normal helix is naturally of importance in connection with the number of teeth in the gear. The normal pitch multiplied by the number of teeth must naturally equal the length *a g h d* of this helix measured between its intersections *a* and *d* with the helix of a single tooth. Note that the length of the normal helix to be considered is the length *a g h d* between its intersections with the tooth helix and not the length *a g h i p q* of a complete turn around the cylinder. That this is true may be seen by reference to Fig. 2, in which the angle *k a l* is nearly a right angle. It is apparent from this illustration that the length of the normal helix from *a* to *d* takes in all the teeth and that *a o*, multiplied by the number of teeth, must equal *a h p d* and not *a h p q*. This length *a h p d* is always less than *a h p q*, and usually much less. Fig. 3 *A* is a development of Fig. 2 on a reduced scale, *a d* being the developed length of the normal helix. Fig. 3 *B* and Fig. 3 *C* show how with the same circumferential pitch and the same number of teeth but a reduced value of the angle *k a l*, the length of the normal helix which cuts all the teeth grows shorter until it may make but a small part of a complete turn around the cylinder. It is clear that in all cases the line *a d* cuts all the teeth precisely as does the circumference *a a*, which goes completely around the cylinder. It is also clear that if the normal pitch is decided upon at the start, a diameter of cylinder and a helix angle must be found such that the normal pitch, multiplied by the number of teeth, shall equal the length of the normal helix between two intersections with the tooth helix.

It is natural to ask: Why not employ the circumferential pitch and so deal directly with the circumference instead of the normal helix? Because we do not know what it is. The normal pitch is determined by the cutter used, while the circumferential pitch depends also upon the helix angle, and until this angle is known the circumferential pitch is not known.

In the extreme case of a spiral gear in which the helix angle is so small that the gear becomes a single thread worm, as in Fig. 4, points *o* and *d* coincide and the length of the helix between *a* and *d* becomes the normal pitch. It is, however, true as before that the normal pitch, multiplied by the number of teeth, which is now one, is still equal to the length of the normal helix between two intersections with the tooth helix.

A glance at Fig. 3 will show that in gears of the same diameter the length of the normal helix* grows shorter as the angle *k a l* grows less, and hence that it and its gear will contain successively fewer and fewer teeth of the same normal pitch. That is to say, the number of teeth in a gear varies with the helix angle as well as with the diameter and *the number of teeth in two gears of the same normal pitch is not necessarily proportional to the diameters.* In fact, it is never so proportional, except when the angle *k a l* is equal to 45 degrees. *The diametral pitch of the cutters and the diameter of the gear thus do not determine the number of teeth.*

The two facts thus developed are fundamental and will bear re-stating:

First, *the number of teeth is equal to the length of the normal helix divided by the normal pitch.*

Second, *the numbers of teeth in a pair of gears are not proportional to the diameters, except when the angle of the tooth helix is 45 degrees.*

THE SPEED RATIO.

Fig. 5 illustrates the simplest possible case of a pair of spiral gears. The gears are of equal size and the tooth helix has an angle of 45 degrees. Such a pair of gears will obviously run at the same speed—that is, have a speed ratio of 1—and as obviously both will have the same number of teeth. Now, unlike spur gears, there are two ways in which the speed ratio of such a pair of spiral gears may be varied. First, the diameters of the gears may be changed, as with spur gears, the angle of the tooth helix remaining unchanged, as in Fig. 6; and second, the angle of the helix may be changed, the diameters of the gears remaining unchanged, as in Fig. 7. These methods act in very different ways. The first method is analogous to the procedure with spur gears. As with spur gears, the circumferential or pitch line speed of the two gears remains, as before the change, equal, but the length of the circumference of the two gears is unequal and the larger one thus has a less number of revolutions than the smaller one. The second method is entirely unlike anything seen in connection with spur gears. By it the pitch line speeds of the two gears are made unequal, and hence, while their diameters are equal, the lower one revolves the more slowly. This points out another fundamental difference between spiral and spur gears: With spiral gears, unless the helix angle is 45 degrees, *the pitch line speeds of two mating gears are not the same.*

The two methods of changing the speed ratio shown in Figs. 6 and 7 may be combined. That is, part of the desired change in speed may be obtained by changing the diameters of the gears and the remainder by changing the angle of the helix. Given the speed ratio and the diameter of one of the gears, we may assume a helix angle and find a diameter for the second gear to go with it which shall give the desired speed ratio and, having done this, a second angle may be assumed and a second diameter be found. There are thus an indefinite number of combinations of angles and diameters which will give the required speed ratio. Note, however, that with the diameter of one gear fixed, every change in the diameter of the other changes the distance between centers, that not every angle of helix can be obtained by the gears which are furnished with universal milling machines, and that if ready-made cutters are to be used, the lengths of both normal helixes must be exact multiples of the normal pitch of the teeth. The problem of designing spiral gears thus consists of finding a pair which shall have a given center distance, helix angles which can be cut with the means at hand, and such a normal pitch that stock cutters can be used. Remove these restrictions and laying out a pair of spiral gears becomes simple. It is, in fact, frequently necessary to remove one of them, namely, the helix angle limitation, by making new gears for the spiral head which shall cut the angle desired.

Geometrically speaking, there is a wide range of choice in the helix angle. As regards the desirability of different angles

*Of two mating gears the circumferential pitch of one is equal to the axial pitch of the other, and *vice versa*. The axial and circumferential pitches are of small importance, except in the case of worm gearing. In making a worm we deal with axial pitch, and in making a worm wheel, with circumferential pitch. In such spiral gears as are made with a formed milling cutter (not a hob) we are concerned chiefly with normal pitch.

*"Length of normal helix" is to be understood as meaning the length of that helix between two intersections with the same tooth helix.

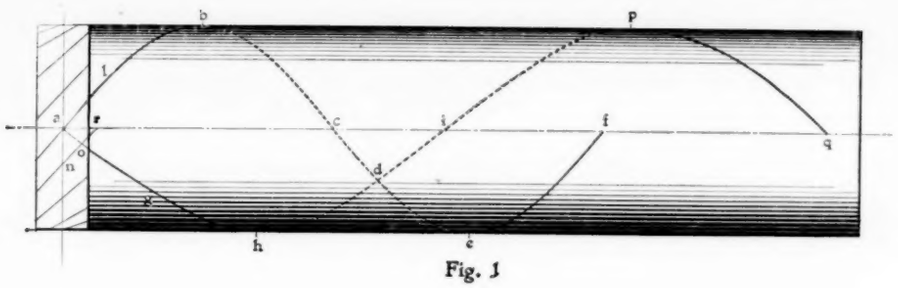


Fig. 1

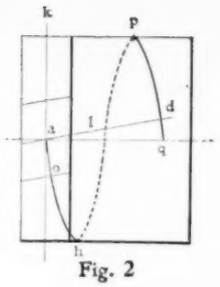


Fig. 2

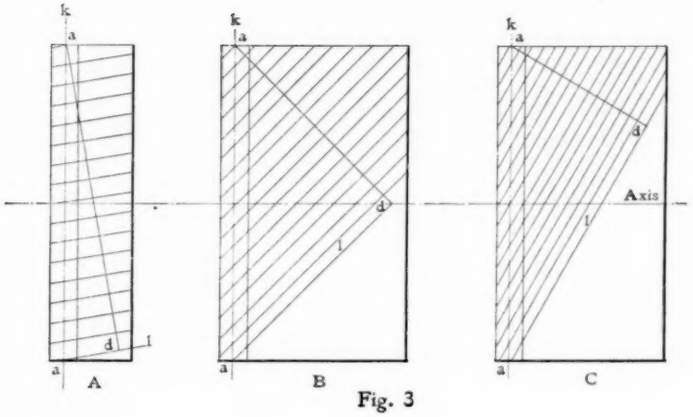


Fig. 3

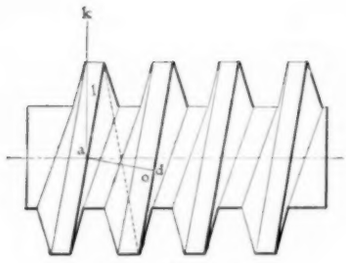


Fig. 4

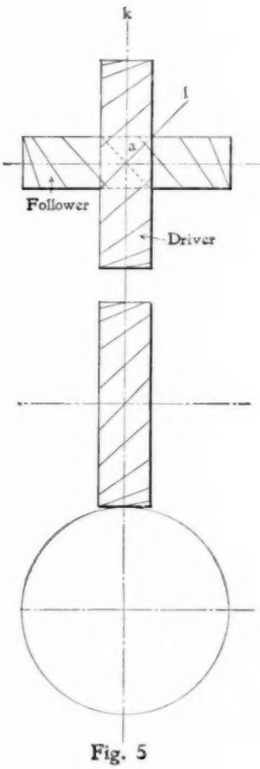


Fig. 5

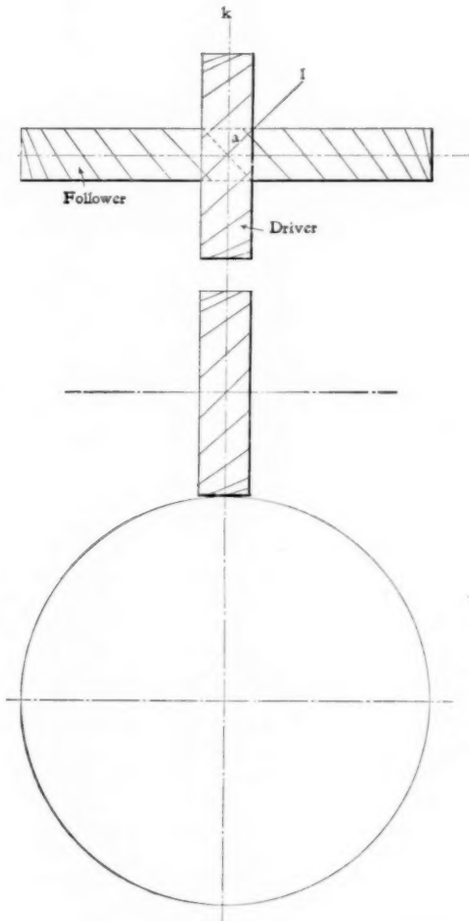


Fig. 6

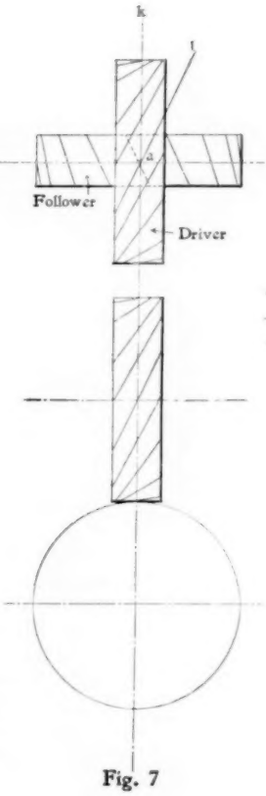


Fig. 7

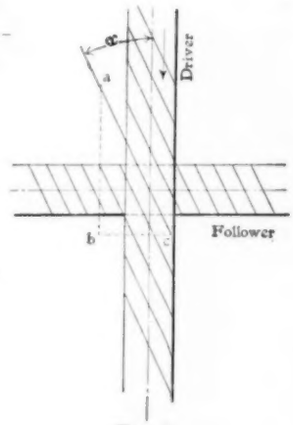


Fig. 8

American Machinist

THE ACTION OF SPIRAL GEARING.

from the standpoint of durability, the conditions are essentially the same as in worm gearing. Reference to the article, "Modern Practice with Worm Gearing," published in the issues of January 13 and 20, 1898, will show that the most favorable angle for durability is 45 degrees. There is, however, but a trifling increase in wear down to 30 degrees, no serious increase down to 20 degrees, and no destructive increase down to about 12 degrees. Where gears are to transmit considerable power the best results should attend the use of angles between 30 and 45 degrees, while angles as low as 20 degrees may be used without hesitation, and as low as 12 de-

grees if the gears are to run in an oil bath or do light work only. The angle may also be increased above 45 degrees by similar amounts and with similar results.

Fig. 8 is a development of the gears of Fig. 7, the angle α of Fig. 8 being equal to $k\,a\,l$ of Fig. 7, but in reversed position, because in Fig. 7 the upper side of the driver is seen, while in Fig. 8 the direction of the teeth is that of the lower side of the driver.

It is clear that if the driver move in the direction of the arrow it will, while moving the distance $a\,b$, push the driven gear the distance $b\,c$, and the pitch line speeds will have the relation:

$$\frac{\text{p.l. speed follower}}{\text{p.l. speed driver}} = \frac{b\,c}{b\,a} = \tan.\ \alpha.$$

If the gears have the same diameters, their number of revolutions will be in the same ratio as their pitch line speeds—that is:

$$\frac{\text{rev. follower}}{\text{rev. driver}} = \tan.\ \alpha$$

or

$$\text{rev. follower} = \text{rev. driver} \times \tan.\ \alpha.$$

If the diameter of the follower be increased, its number of revolutions will be reduced in the same ratio—that is:

$$\text{rev. follower} = \frac{\text{diam. driver}}{\text{diam. follower}} \times \text{rev. driver} \times \tan.\ \alpha,$$

or

$$\frac{\text{rev. follower}}{\text{rev. driver}} = \frac{\text{diam. driver}}{\text{diam. follower}} \times \tan.\ \alpha,$$

the angle α being taken from the driver.

This is a complete formula for the speed ratio of spiral gears having shafts at right angles. But for the limitations imposed by the use of stock cutters it, together with the fact that the sum of the diameters of the gears must equal twice the center distance, would be all that is required for designing such gears. Note that it differs from the corresponding formula for spur gears only by the introduction of the factor tan. α.

(*Continued next week.*)

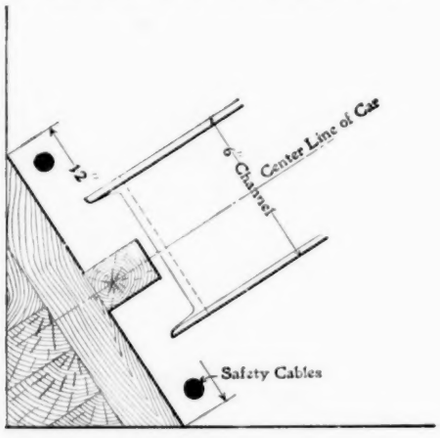


Fig. 1

A Graphical Method of Laying Out the Corner of an Elevator Car.

BY F. B. KLEINHAUS.

The corner of an elevator hatch has been found a convenient place for the guide which, as a usual thing, is laid out by a trial method. Twelve inches across the corner is a common requirement for the safety device (see Fig. 1). When the car is square it is easy to lay off a line 12 inches long across the corner at an angle of 45 degrees to the center line, but ninety-nine times out of a hundred the car isn't square, and then the problem is not so easy.

The usual method is to take two triangles, placing the right angle of one against the side of the other, and, having found the center of the car, the triangles are slid around until a position is found where the center line is 6 inches from the line of the hatchway on either side. Anyone who has had to lay off the corners in this way will appreciate the graphical method shown in Fig. 2. The center of the car is shown at C, and $A\,O\,B$ is the line of the hatchway. It is required to find a line $D\,G$ in such a position that a normal to its center F will pass through the center C.

From O, as a center, with a radius r equal to 6 inches, describe the arc shown. Select two points D_1 and D_2, one above, and the other below the point where you think D would come; connect them to the center C, and describe the semicircles E^1 and E_2 on them. With a radius of 6 inches and D_1 and D_2 as centers, describe arcs as shown, cutting E_1 and E_2 at the points S and R respectively. Through S and R draw a straight line which will cut the original arc, struck from O, at some point F. Join F and C, and through F draw a line $D\,G$ at right angles to $F\,C$. This line will be 12 inches long, and will have $F\,C$ normal at its center, which is the required condition.

As a proof, we know that the center F of the line $D\,G$ describes a quadrant of a circle when it is made to slide on the right angle $A\,O\,B$, the radius of this circle being r. F is therefore in the arc struck from the point O, with a radius r. If another curve can be found which contains F, their intersection will determine the point.

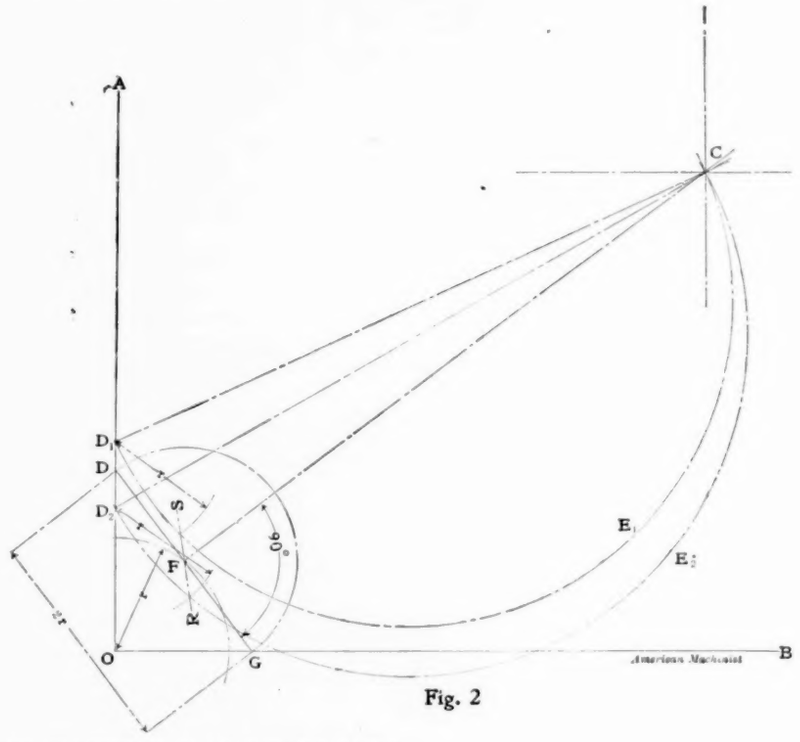


Fig. 2

LAYING OFF THE CORNERS OF AN ELEVATOR HATCH.

Referring to Fig. 3, the line $D\,G$ is shown with $F\,C$ normal at its center. From D as a center, and r as a radius, strike an arc as shown. This arc will pass through F, $D\,G$ being equal to $2r$. $D\,F\,C$ is a right angle, and therefore if we strike a semicircle on $D\,C$ it will pass through F. By taking a series of points D_1, D_2, D_3, etc., along $A\,O$, connecting them to the center, describing semicircles on them, and then from each point striking an arc, with the radius r as shown, a series of points K_1, K_2, K_3, etc., will be determined. Connecting them by a line $K_1\,K_8$, this line is seen to be straight for a considerable distance on each side of F. It is therefore only necessary to make the construction for two points, in order to determine the line.

One other thing will be noticed, namely, that the centers of the semicircles struck

on $D_1 C$, $D_2 C$, $D_3 C$, etc., are all on the same straight line $x y$, which in turn is parallel to $A O$.

Tested by Efficiency.

A mill owner went down to his engine room one day and found his engineer sitting by the door reading the daily paper and apparently oblivious to everything else, not excepting the fact that Mr. Proprietor stood around for several minutes, evidently looking for something which he could not see. The next day the owner came back and again found the engineer deep in the paper. On the third day Mr. Proprietor became impatient, and, turning

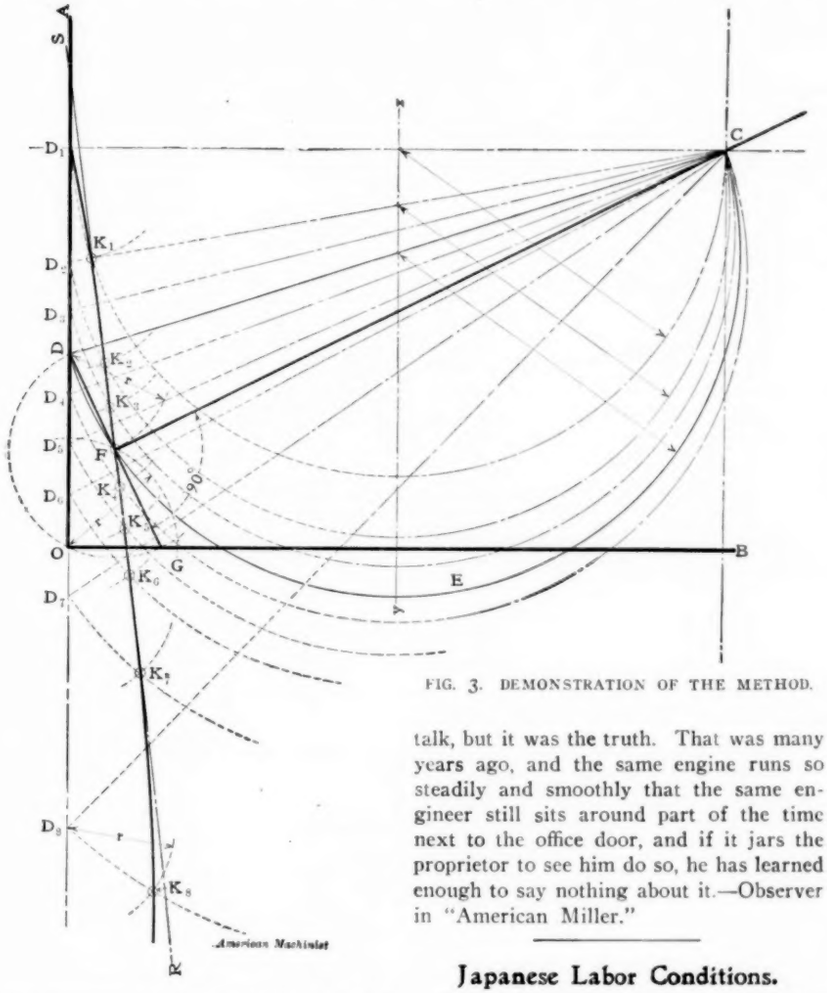


FIG. 3. DEMONSTRATION OF THE METHOD.

to the engineer, inquired: "Can't you find anything to do?" The reply was: "No. Do you see anything that needs doing?" "No, I do not," replied the proprietor, as he started for the office. Now, this engineer knew exactly what his engine was doing; that it was running all right and meeting every demand, and as he thought of the question propounded to him, he commenced to get hot in the collar. Going to the office, he said to the proprietor: "You came down and asked me if I could find anything to do. Now, I want to ask you if your engine does not run all right?" "Yes." "When the signal is given to start does it ever fail to start?" "No." "When the signal is given to stop does it stop?" "Yes." "When you have an engineer who always has his engine ready to start when called to do so, who keeps it running when it is wanted, and who always stops it when signaled to do so, does he not meet all needed requirements?" "Yes." "Well, when you get an engineer who cannot do this, go down and discharge him. That's my way. You have been accustomed to having an engineer who ran around all day with an oil can in one hand and a monkey-wrench in the other, looking for something to do and spoiling things so the engine would not run. That is not my way." It was plain talk, but it was the truth. That was many years ago, and the same engine runs so steadily and smoothly that the same engineer still sits around part of the time next to the office door, and if it jars the proprietor to see him do so, he has learned enough to say nothing about it.—Observer in "American Miller."

Japanese Labor Conditions.

E. C. Bellows, Consul-General at Yokohama, has transmitted to the State Department abstracts from articles in Japanese papers on the want of skilled labor in Japan. The following are among the statements contained:

The Japanese believe that wages are low in Japan, though the rate of interest is high. It is true wages are low, but they are higher than in Europe and America, when the cost of labor is taken into consideration. Take the spinning industry, for instance. The average wages in South America are about 1 yen (50 cents), whereas they are about one-fourth of that in Japan. Yet the individual amount of production is much more in the former than in the latter. The lack of skilled labor is a serious hindrance to the introduction of foreign capital, so earnestly desired by Japanese financiers.

Children under ten years, even of scarcely six or five years of age, are largely employed in factories, and men are generally made to work for injuriously long hours, while women have to work for the same periods to which the men are subjected. It is no exaggeration to say that fourteen, sixteen, and even eighteen hours a day are often worked in factories. The Tokyo Tramway Company, which pays a dividend of from 30 to 40 per cent., pays its laborers $5 to $6 a month, and works them from fourteen to seventeen hours a day.

In many factories no provision is made for suitable ventilation and lung diseases are very common among the employees, while the arrangements are such that in case of fire escape would be almost impossible. Japan has no laws for the protection of labor, or restricting the employment of women and children, but the subject is being considerably discussed. The agitation comes principally from the educated and professional or leisure classes, rather than from the laborers themselves.

It is asserted, however, that the rich and poor of Japan are not separated by a gulf comparable with that dividing the plutocrat and pauper in the West, and that the poor man in Japan, with his compensations in holidays, fêtes, and festivals, finds nothing intolerable in his lot.

A Small Blanking, Drawing and Bending Die.

BY VER. I. NIER.

The die topic which now seems to be occupying the various mechanical papers has brought out a variety of ideas, the dies described ranging from the ordinary blanking die to the more complicated built-up dies. The tool of which this article tells I consider of decided interest, as the base of the tool is only 2½x2 inches, and it performs three distinct operations: blanking, drawing and bending. It may be termed a built-up die, as there are nine parts to it without the screws, the plunger also being made in sections and containing four parts.

This tool was made to manufacture what are termed "boxes." These "boxes" were made of No. 30, Brown & Sharpe, brass stock. Fig. 1 is a side view and section of the "box." The first work was making the bottom plate *A*, Fig. 3, of tool steel, 2½x2 x⅝ inches, the sides being planed with a 5-degree angle to fit the die dish. The hole *B* was then cut through the die, the width being the width of the blank to be cut and long enough to allow a surplus on the plunger outside of the drawing part. The hole was then recessed back to the dotted lines *C*, this recess being the thickness of the tips on the drawing plates.

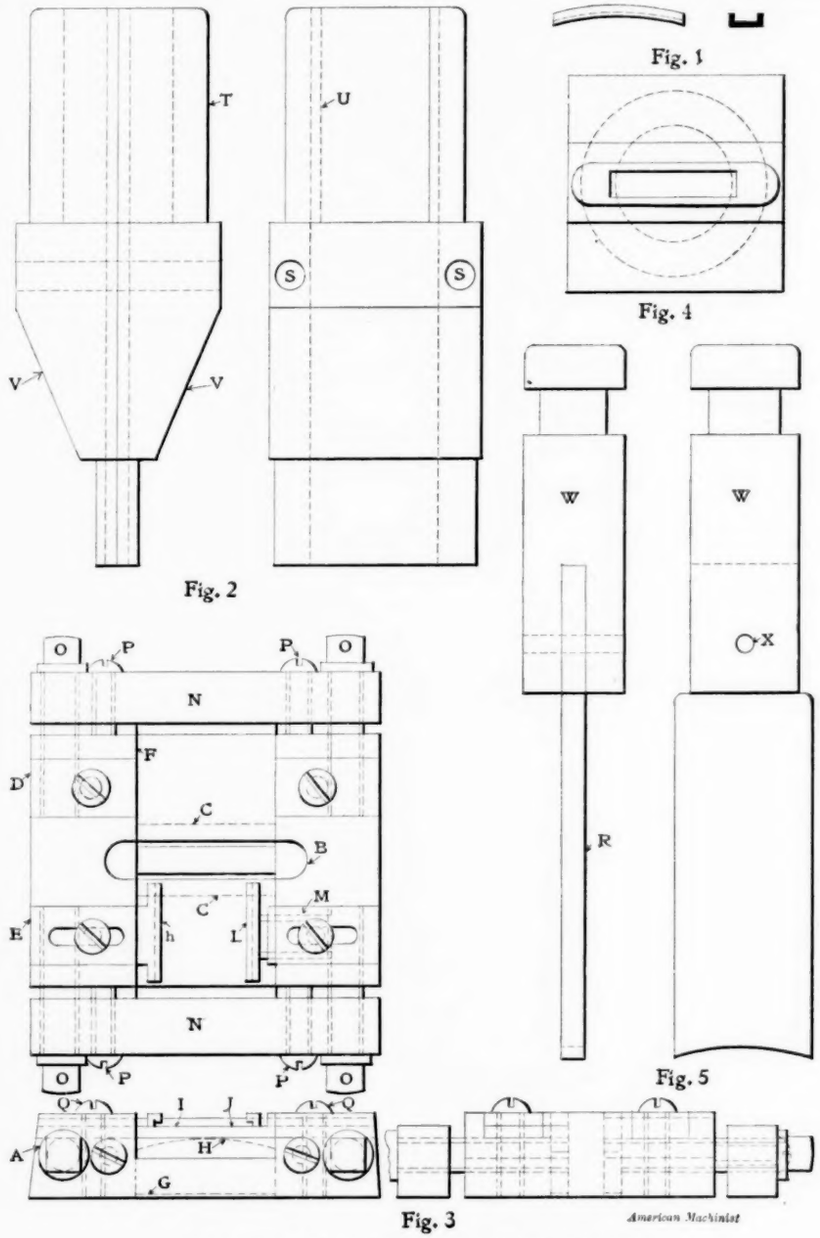
The plate was then returned to the shaper for cutting slots *D* for the guide plate, *E* for the cutting plate of the die and slot *F* for the drawing plates, the first two slots being 3-16 inch deep and the last 5-16 inch deep. The drawing plates were planed to fit slot *F*, with a tongue ¼ inch deep and 5-32 inch thick, extending down through the die to dotted line *G*. The top edge of this tongue was then curved to dotted line *C*, the same radius as the required form of the box, this being shown by dotted line *H*. These pieces were then hardened and tempered. The cutting blade was fitted into groove *E*, being 3-32 inch thick, the center part on one side extending to the edge of the hole in the die for the cutting plunger, the other side extending to the end of the die. The guide *J* was fitted into the groove *D*, the same as the cutting blade except that the thickness was 3-16 inch, or equal to the depth of the slot. This guide served as the gage to which the stock was pushed into the die.

The two guides *K* and *L* were fitted into slot *E* and fastened on top of the cutting blade, guide *K* being made in one piece with a projection on each side, one side extending nearly to the edge of cutting blade, the opposite side to the end of the die. The opposite guide *L* was fitted into the opposite side of the slot. This guide was formed on a different plan. A piece was planed to fit the slot, and two holes for the pins *M* were drilled. A narrow strip was then cut to the length of the projecting ends of the left-hand guide; two holes were drilled through this part to correspond with holes in part just described, and into these holes were driven the two pins. Two small open spiral springs were then made and one placed in each of the holes in the stationary part of the guide. The faces of each of these guides were lipped under 1-32 inch. This served to hold the stock on the face of cutting blade. An elongated hole was then cut in each guide for fastening. The end or adjusting blocks *N* were then planed ⅜x1½ inch and as long as the width of the die, the ends with the same angle as the bottom plate. These blocks were fastened by screws *O*, the screws *P* being tapped into the blocks and the ends resting against the ends of the die. These blocks served to adjust the drawing plates *F*, the end of these projecting beyond the ends of the die. The screws *Q* fastened the guides and cutting plate to the bottom plate. This cutting plate was then tempered and the die was ready to be assembled, which, however, could not be done until the plunger had been completed.

The cutting plunger, Fig. 2, with end or face view, Fig. 4, was of tool steel, ¾x1½x8 inches, with grooves planed on one side and in the center, 15-16 inch wide and .085 deep, or one-half the thickness of the drawing plunger. This piece was sawed into two pieces of equal length.

The cutting plunger was now laid aside and the drawing plunger, Fig. 5, was taken in hand. The blade *R* was planed .170 inch thick and 15-16 inch wide. After this blade had been finished and fitted to the pieces just planed for the cutting plunger it was placed in the slot planed in the cutting plunger, and the two halves were clamped together. The pin holes *S S* were then drilled and pins fitted, a driving fit, into these holes, this being the only means of fastening the two parts together, as the screw fastening the shank into collet was relied upon to do the remainder. The shank *T* was turned to fit the collet in the press, the hole *U* was bored a trifle larger than the shank of the drawing plunger, the sides *V* were beveled off, and the end which served to do the cutting was planed as near to size as possible. All that now remained was to finish the drawing plunger. The lower end rounded out the radius of the bottom of the box, the shank *W* was turned to fit the drawing plunger in the press, and the end grooved for the holder which held it in place. A groove was planed in the opposite end, into which the blade was fitted and pinned.

The drawing plates being placed in the slot *F*, the guide or stop *J* in slot *D* and fastened with the screws *Q*, the cutting blade *I* was placed in slot *E*. On top of this were placed the two guides *K* and *L*, and the end blocks *N* were fastened on. The drawing plunger was now brought into use. Taking two pieces of the stock to be used, and placing one on each side of the blade of the drawing plunger, then placing the same between the two drawing plates, these plates are adjusted by unscrewing the screws *P* and tightening screws *O*. The guides *K* and *L* are then adjusted to the width of the stock, the right-hand guide being forced toward the



A SMALL BLANKING, DRAWING AND BENDING DIE.

stock, so that the springs behind the pins will form a tension great enough to always keep stock against the left-hand guide. The screws are then tightened and the tool is ready for use.

The stock having been stripped to the desired width, the end is pushed under the lips of the guides and against the stop *J*, after the end has been trimmed straight, as the cutting plunger does not cut on the back. The press is put in motion; the ram descends and cuts a blank from the stock, forces it down to the top of the drawing plates and holds it in position until the drawing plunger descends and shapes the blank to the radius. It then continues down through the drawing plates and the box drops from the press finished, and in the shape shown in Fig. 1. This tool can be operated by a boy, as the press remains continually in motion, and all that is required is to push the stock through to the stop when the ram ascends. It would be hard to tell the number of thousand boxes this tool has formed without repair. The press makes 200 strokes per minute, and runs continually, being used sometimes as long as a week at one time.

Molding Land Rollers.

Cylinder rollers similar to the sketch, Fig. 1, are required in fairly large quantities in the making of land rollers and other agricultural implements. The sizes of the rollers in general demand run from 16 to 24 inches in diameter, and from 4 to 8 feet in length. The width of the implement depends upon the capacity of the gateway which admits it to the fields where it is required to be worked, while the diameter is fixed by the fancy or buying capacity of the farmer. Each implement contains one,

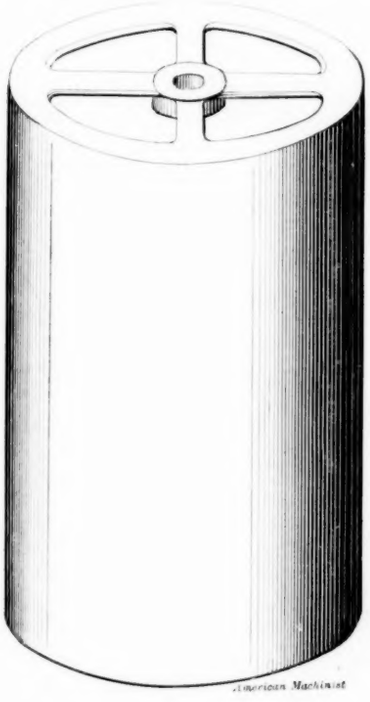


FIG. 1. THE CASTING TO BE MADE.

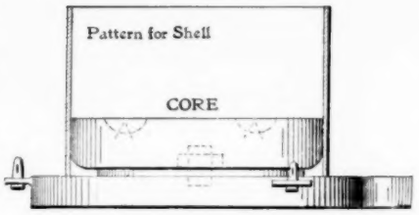


FIG. 2. BEGINNING THE MOLD.

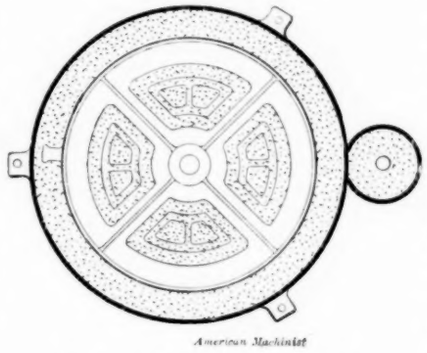


FIG. 3. MOLD WITH TOP REMOVED.

two, three, or even four cylinder rollers, the number depending upon the width of the implement. It is therefore rather a difficult matter to make the castings as profitably as for many other classes of implements in which the demand for one or two sizes is the rule.

The method of molding these cylinder rollers is best performed, as far as I know, in the following manner. In the first place, the roller pattern consists of a cylindrical shell, machined both outside and inside and 12 or more inches long, and a pattern forming the hub and arms. A corebox to form the arms and hub also is required. Circular molding boxes are used having a circular pocket cast to the side, and in this pocket the down gate is located, as all rollers are gated from the bottom. The flasks are made 12 inches deep; they are provided with pins and are made interchangeable. A few parts are made 6 inches deep and 3 inches deep, to provide for different lengths of rollers. Two inches space is allowed for sand around the outside of the pattern, and the flasks are provided with numerous small holes to take the vent off the outside of the mold. In molding, the drag is filled with sand and struck off level with the edge. This face is sleeked and blackened and the pattern is set on the bed, and the core, which has been dried, is placed into the cylinder pattern and also on to the bed, as shown in Fig. 2. Before placing the dry sand core inside the pattern the core in the hub is fixed in a print on the bed. This print is located by placing the pattern (before referred to) of the hub and arms in the cylinder pattern and pressing it down on to the bed, leaving the print impression. The outside box is next placed over the pins and the ramming up is proceeded with, the facing being kept weak and rather dry. Three or four props are rammed up in the core, and they are brought up to the joint in between the arms and are made to contact with bars in the top part of the box. These props take care of the lift formed by the core containing the arms and hub. As the ramming proceeds, the pattern is rapped and drawn up by the crane until the desired length of mold is obtained. A staff the length of the casting required, minus the length of the cylinder pattern, is provided for every size, and by placing the staff on the top edge of the cylinder pattern the hight of the cope is obtained, and the various parts of the flask are placed to suit. When the pattern is drawn to the hight required the hub and arms are bedded in and the joint is made. The top is rammed and lifted off; the cylinder pattern is now drawn out of the mold, the core having been well vented and a few irons placed at intervals to stiffen the core. A small gate is cut into the mold at the top joint on the side opposite to the down gate. The mold having been finished, the cope is lifted by the crane about 6 inches, to allow the bottom in-gate to be cut, and any loose sand to be cleaned out. The cope is lowered to its place and the top is dropped on. Fairly hot metal is required to produce clean skinned castings, free from seams and cold shuts. The mold is

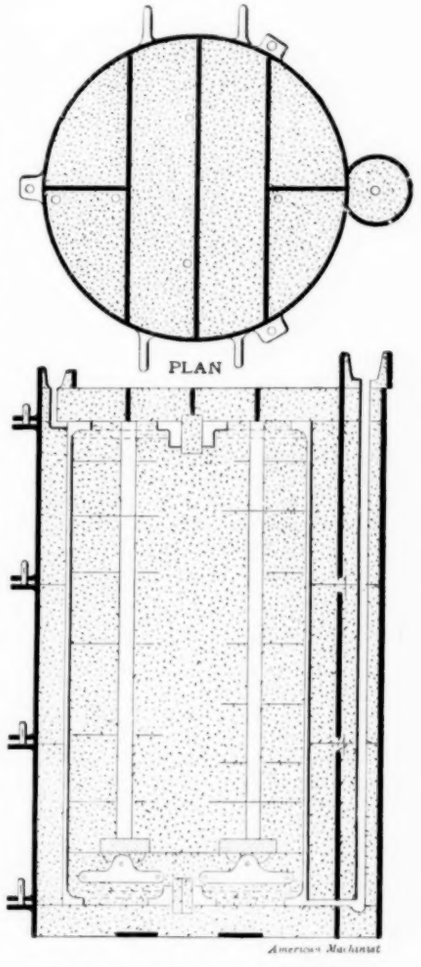


FIG. 4. SECTION OF MOLD COMPLETE.

poured from the bottom gate until about three-quarters cast, when a shank is put into the gate cut in the joint, so that both finish pouring at the same time.

GEO. BUCHANAN.

Wrexham, North Wales.

Diagram for Motor Vehicle Problems.

BY P. S. BUSHNELL.

The accompanying chart is designed for the purpose of quickly solving some of the calculations arising in motor vehicle design. The full lines marked "diameter of wheel" represent the revolutions per minute at one mile per hour of wheels of different diameters. The dotted lines represent ratios 2 to 1, 3 to 1, etc., in the gearing.

The values for revolutions per minute of drive wheels at one mile per hour are as follows: 28″ = 12, 30″ = 11.2, 32″ = 10.55, 34″ = 9.9, 36″ = 9.34, 38″ = 8.86, 40 = 8.41, 42″ = 8. Those for 28″, 30″ and 32″ wheels are located on the left-hand vertical scale, and for 34″, 36″, 38″, 40″ and 42″ on the right-hand vertical scale. This is done for the purpose of making a consecutive reading of the revolutions per minute of drive wheel for a certain number of miles per hour and the corresponding revolutions per minute of motor or countershaft for a given ratio of gearing.

For example: Given a drive wheel 28 inches in diameter, what will be the revolutions per minute of the motor at a speed of 20 miles per hour with a ratio of 5 to 1?

From 20 on the lower horizontal scale follow up the line to its intersection with the diagonal marked 28″ and across to 240 revolutions of the driving wheels on the left-hand vertical scale. Finding the intersection of the same horizontal line with the dotted diagonal marked 5 to 1, we read on the upper horizontal scale 1200 as the revolutions per minute of the motor.

It will be noticed here that if the number of miles per hour is found in the upper line of figures at the bottom, the corresponding number of revolutions per minute

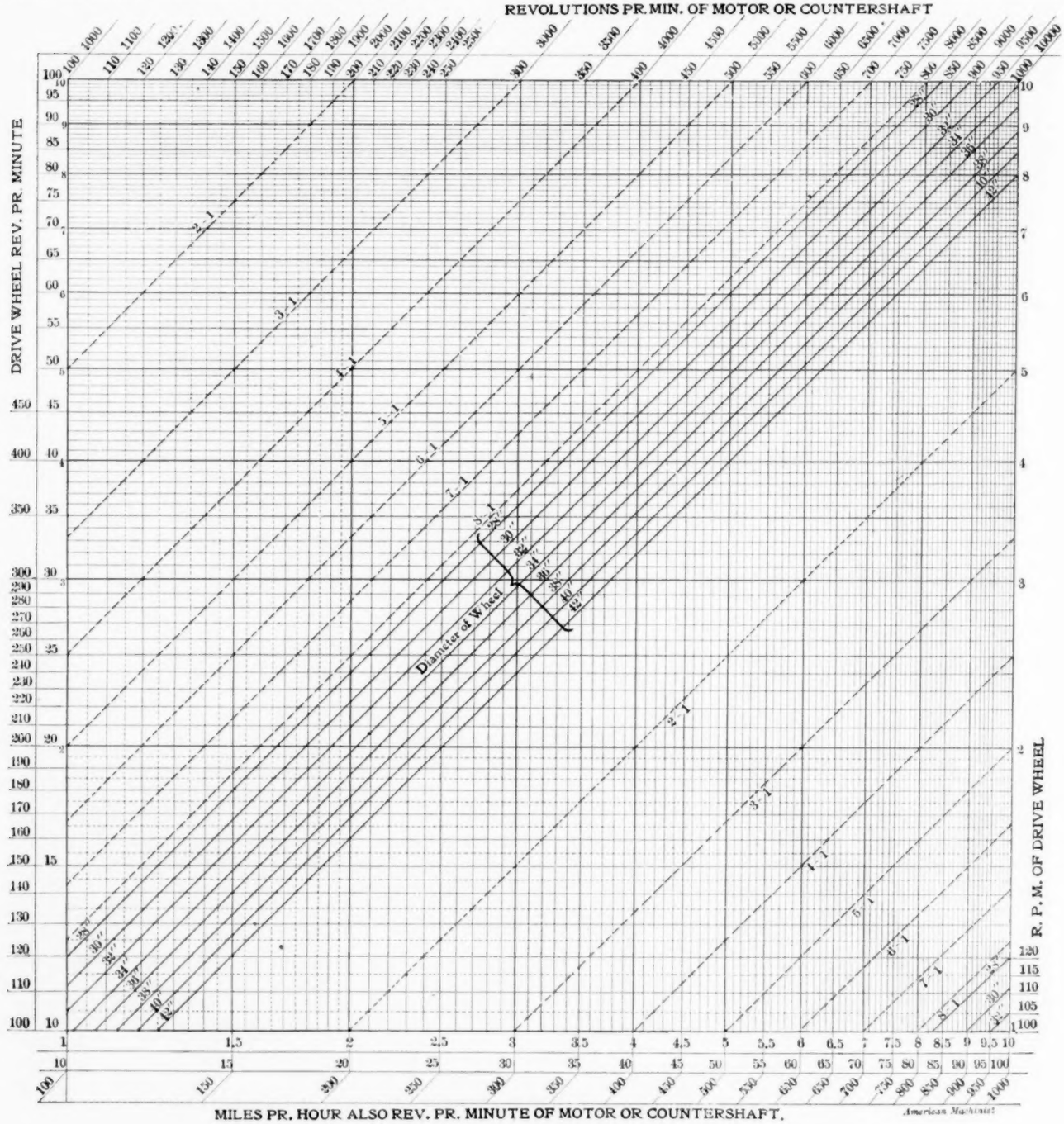

REVOLUTIONS PR. MIN. OF MOTOR OR COUNTERSHAFT
DRIVE WHEEL REV. PR. MINUTE
R. P. M. OF DRIVE WHEEL
Diameter of Wheel
MILES PR. HOUR ALSO REV. PR. MINUTE OF MOTOR OR COUNTERSHAFT.
American Machinist

DIAGRAM FOR SOLVING MOTOR VEHICLE PROBLEMS.

of driving wheel will be found in the inner column at the left, and that the number of revolutions of motor for a given ratio will be found in the lower line at the top.

If the number of miles per hour be taken from the second line at the bottom, the revolutions of driving wheel will be found in the outer column at the left, and of the motor in the upper line at the top.

When lines from the left-hand scale do not intersect with a given ratio diagonal from the upper horizontal scale they will be found to intersect with diagonals from lower horizontal scale, the results being read on the same scales used for miles per hour.

For example: A wheel 42 inches in diameter at 25 miles per hour will make 200 revolutions per minute. With ratio of 2 to 1 the motor will make 400 revolutions per minute, this result being read on lower horizontal scale.

It is obvious that examples the reverse of those given are also readily solved by means of the diagram. If a motor make 120 revolutions per minute with a ratio of 3 to 1, how fast will it drive a carriage having driving wheels 42 inches in diameter?

From 120 on the upper horizontal scale follow the line to its intersection with the ratio diagonal 3 to 1. Reading the result on the vertical scale, we have 40 revolutions per minute of driving wheels. Finding the intersection of this line with the diagonal for 42 inches, we read on the lower horizontal scale 5 miles per hour.

Considerations Affecting the Hight of Gear Teeth—I.

BY ROBERT A. BRUCE.

While the question of reducing the addendum of gear teeth is a very old one and has often been raised, it has not within my knowledge received adequate treatment. While it is a subject with which it is extremely hard to deal without going into the mathematical relationships which exist between the arcs of contact, number of teeth, etc., I have endeavored in this article to steer clear of all purely mathematical work by merely recording on squared paper the results of a large number of calculations from formulas which I have derived and developed. The point of view which, I think, is really fresh in this paper is that which aims at exhibiting the great importance of the increase of strength which attends any shortening of the normal addendum. For this purpose a large number of graphical determinations of the forms of teeth on a large scale had to be made after the fashion set by Mr. Wilfred Lewis. This was very laborious but the results are entirely satisfactory, and the resulting curves, giving the strength factors under various conditions, supply a means by which it is possible for a practical man to make changes in the direction advocated without further investigation.

Comparison of the various rules determining the ratio of the addendum to the circular pitch shows that the proposed values lie between .3 and .35. In several special cases, however, very much shorter teeth have been used with advantage and various eminent authorities have declared themselves in favor of reducing the standard length of the addendum. The standardization of milling cutters for gear teeth leaves little room for choice in the case of ordinary gearing, but for large cast gears or where special cutters have to be made good reasons can be given for a departure from the standard in the direction indicated.

Some of the more important of these reasons are dealt with in the present article and the limits of the process are discussed.

The length of the addendum of a tooth has an important bearing upon (1) the length of contact arc and consequently to some extent on the wear of the tooth; (2) the maximum obliquity of action (when this is variable); (3) the strength and therefore the minimum allowable pitch for a given load, and (4) the rubbing friction and hence both the efficiency and wear of the teeth.

The general effect of reducing the addendum will be to (*a*) decrease the arc of contact and increase the arc during which the whole load is concentrated on a single pair of teeth; (*b*) decrease the maximum obliquity of action; (*c*) increase the safe load borne by a tooth of a given pitch, and (*d*) decrease friction by reducing the extreme rubbing velocity, thus augmenting the wearing qualities of the tooth.

While (*a*) undoubtedly leads to increased wear on those regions over which the pressure of a concentrated load is ex-

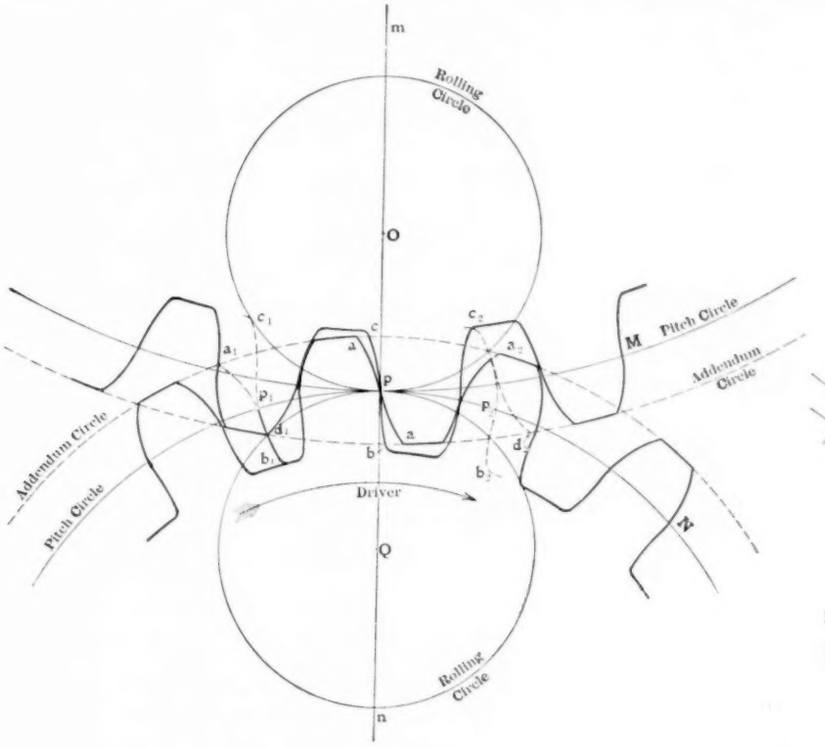


FIG. 1. CYCLOIDAL TEETH IN GEAR.

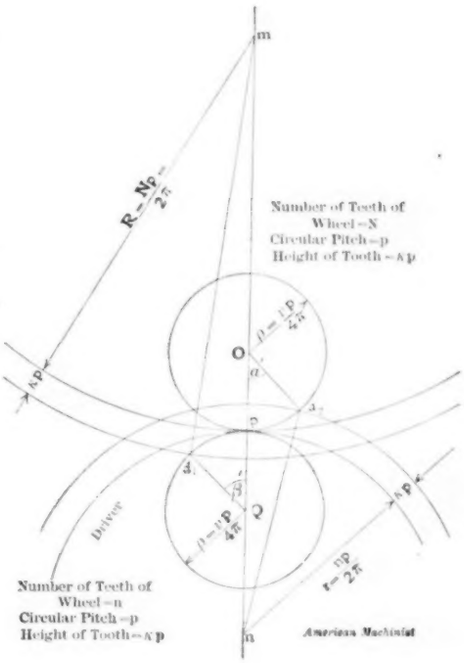
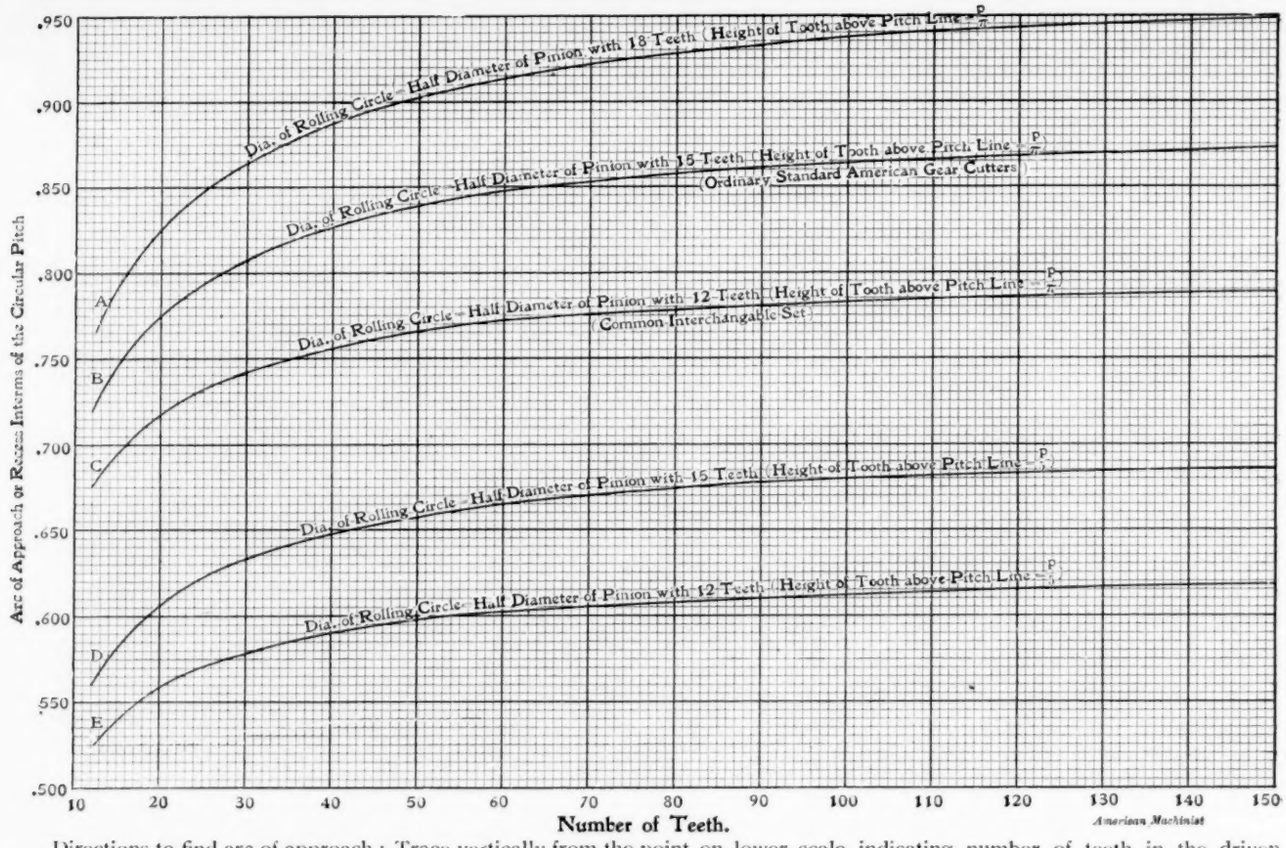


FIG. 2. CONDITIONS FOR FINDING IN GENERAL TERMS THE ARCS OF RECESS AND APPROACH.


Arc of Approach or Recess Interms of the Circular Pitch
.950
.900
.850
.800
.750
.700
.650
.600
.550
.500
Dia. of Rolling Circle = Half Diameter of Pinion with 18 Teeth (Height of Tooth above Pitch Line = p/π)
Dia. of Rolling Circle = Half Diameter of Pinion with 15 Teeth (Height of Tooth above Pitch Line = p/π)
(Ordinary Standard American Gear Cutters)
Dia. of Rolling Circle = Half Diameter of Pinion with 12 Teeth (Height of Tooth above Pitch Line = p/π)
(Common Interchangable Set)
Dia. of Rolling Circle = Half Diameter of Pinion with 15 Teeth (Height of Tooth above Pitch Line = p/π)
Dia. of Rolling Circle = Half Diameter of Pinion with 12 Teeth (Height of Tooth above Pitch Line = p/π)
A
B
C
D
E
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
Number of Teeth.
American Machinist

Directions to find arc of approach: Trace vertically from the point on lower scale indicating number of teeth in the driven wheel to curve to suit given conditions, and thence horizontally to left hand vertical scale where the ratio of arc to circular pitch will be found.

To find arc of recess: Proceed in the same way, using the number of teeth in the driving wheel.

Total arc of contact = arc of approach + arc of recess.

FIG. 3. LENGTH OF ARCS OF APPROACH AND RECESS FOR CYCLOIDAL TEETH.

tended, nevertheless this increase is felt at places where the comparative abrasion is small, so that (*d*), leading as it does to reduction of wear at the extremities of the teeth where it is most serious at all times, more than counterbalances the ill-effects of (*a*). Effects (*b*), (*c*) and (*d*) are wholly beneficial, and hence the only limitation is imposed by the fact that reduction of the addendum must not be carried so far as to diminish the arc of contact to an extent that would produce discontinuity of action between succeeding teeth.

In order that the subject may be treated quantitatively it is necessary to deal with each accepted form of tooth separately.

CYCLOIDAL TEETH.

It will be remembered that for teeth of this form the path of contact coincides with the arcs of the rolling circles intercepted between the addendum circles of the wheels in gear. Thus, in Fig. 1, $d_1 p a_2$ is the path of contact, and the arc of contact is $p_1 p p_2$, the rectified length being equal to $d_1 p a_2$, $p_1 p$ being the arc of approach and $p_2 p$ the arc of recess.

The following symbols are used:

p = circular pitch,
h = addendum = $k p$,
n = number of teeth in driving wheel,
r = pitch radius of driving wheel,
N = number of teeth in the driven wheel,
R = pitch radius of driven wheel,
a = arc of approach subtending angle α at the center of the driven wheel,
b = arc of recess subtending the angle β at the center of the driven wheel,
ρ = radius of the rolling circle determined by the consideration that a wheel with ν teeth shall have radial flanks, hence the radius of the rolling circle is half that of the pinion whose flanks are radial.

Let β' be the angle subtended by the path of approach at the center of the rolling circle (and therefore β' is equal to twice the initial angle of obliquity) and let α' be the angle subtended by the path of recess and therefore twice the terminal angle of obliquity. Then (as in Fig. 2) r, R, ρ and h can all be expressed in terms of p, and to find the angles α' and β' it is only necessary to solve the triangles $n O a_2$ and $m d_1 Q$. This leads to the following equations:

$$\left.\begin{aligned} &\text{Arc of recess} = p\,\frac{\nu\,\alpha'}{720} \\ &\text{where } \alpha' \text{ is in degrees and cos. } \alpha' \\ &\quad = 1 - \frac{8\pi k(n+\pi k)}{\nu(2n+\nu)} \end{aligned}\right\} \quad (1)$$

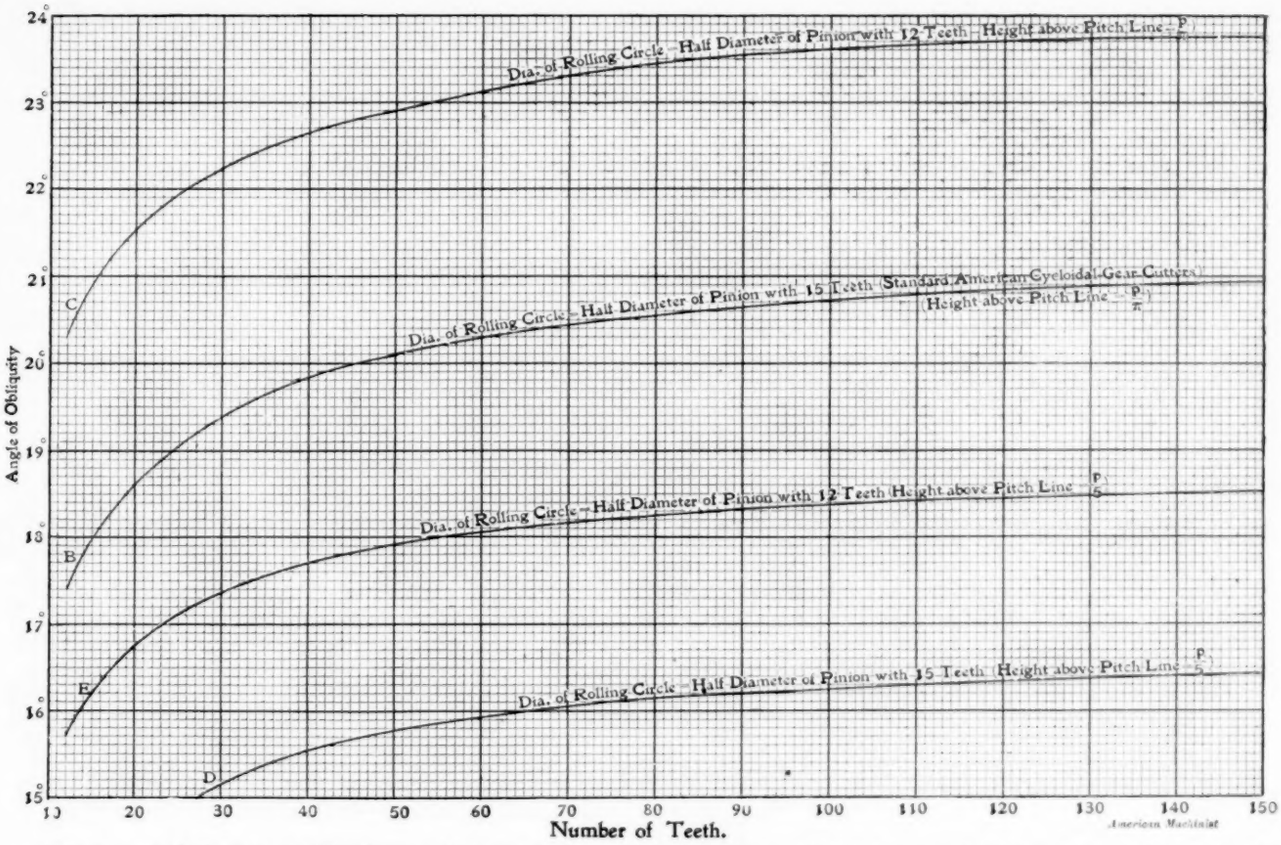
$$\left.\begin{aligned} &\text{Similarly the arc of approach} = p\,\frac{\nu\,\beta'}{720} \\ &\text{where } \beta' \text{ is in degrees and cos. } \beta' \\ &\quad = 1 - \frac{8\pi k(N+\pi k)}{\nu(2N+\nu)} \end{aligned}\right\} \quad (2)$$

Equations (1) and (2) are not very easy to work with, and in order to give some idea of their scope the curves *A*, *B* and *C* in Fig. 3 have been constructed so as to show at a glance the length of the arc of approach or recess when the addendum of the teeth has the normal value. It will be noticed that while curve *C* applies to ordinary cast gearing, in which the base pinion of the set has 12 teeth with radial flanks, curve *B* applies to cut cycloidal gears where pinions of 15 teeth have radial flanks and the curve *A* has been constructed with a view of exhibiting the effects of increasing the size of the rolling circle. In the same way the curves *B* and *C* of Fig. 4 give the values of the maximum angle of obliquity for cut or cast gearing when the addendum is of normal proportions.

It is evident that the length of the path of contact is more than sufficient to insure continuity of contact between successive pairs of teeth.

With wheels forming units of an interchangeable set, the path of contact will be shortest when the two base pinions of the set are in gear, and if continuity of contact is then ensured there will be a margin in the case of pairs having a larger total number of teeth.

Taking 12 as the least number of teeth that need be considered and reducing the



Directions to find angle of obliquity at end of contact: Trace vertically from point on lower scale giving number of teeth in the driver to the curve which suits the given conditions, and thence horizontally to the vertical scale of angles.
To find obliquity at beginning of contact: Proceed in the same way, using number of teeth in driven wheel.

FIG. 4. CURVES SHOWING ANGLES OF OBLIQUITY AT COMMENCEMENT AND END OF CONTACT. CYCLOIDAL TEETH.

arc of contact to $1.05p$ (an arbitrarily chosen value to ensure continuity), we may use equation (1) to determine the least permissible value of h.

Thus if in (1) we put $n = 12$ and $\nu = 12$ and arc of approach $= \frac{1.05p}{2}$, we get $\alpha' = 31°30'$ and hence putting $\cos.\alpha' = .8526$

$$.8526 = 1 - \frac{8\pi k(12 + \pi k)}{12(24 + 12)}$$

from which by solving for k we get $h = \frac{p}{5}$, very nearly. With the same values for n and the arc of approach, but with $\nu = 15$, we should get $h = .178p$.

Curves D and E in Figs. 3 and 4 have been constructed to exhibit the effects (as far as length of contact path and angle of obliquity are concerned) of making the addendum $\frac{p}{5}$ for interchangeable sets where 12 and 15 are the numbers of teeth in the base pinions of the sets.

It is obvious from the limiting values given in these curves that both with the normal and the shortened addendum the load is alternately borne by a single pair and by two pairs of teeth. As already pointed out, the effect of reducing the addendum is to increase the length of that portion of the profile on which the whole load is concentrated. This will be at once apparent on examining Figs. 5 and 6, which represent a pair of wheels in gear, the numbers of teeth being 25 and 20 in each case. In Fig. 5 the addendum of the teeth has been drawn to the ordinary proportions, but in Fig. 6 $h = \frac{p}{5}$. The path of contact in each case is $d_1 k p e a_2$, and the points k and e are found by making the rectified lengths of the arcs $d_1 e$ and $a_2 k$ equal to the circular pitch p. While the point of contact traverses the portion of the contact path $k e$ in each case, the whole load is concentrated on a single pair of teeth. If therefore circles be drawn through k and e concentric with the pitch circles, these will enclose those portions of the profile (distinguished in both figures by thickened lines) which bear the whole load. It will be seen that the extension of these regions due to the decreased addendum in Fig. 6 is much less than might on first consideration have been anticipated. It should also be noted that these regions of concentrated load being comparatively near the pitch point, are subjected to relatively low rubbing velocities.

It is now necessary to examine the influence of reducing the addendum upon the strength of the teeth, the mere inspection of Fig. 6 being sufficient to show that the gain in the case of the shorter form is considerable. The exact gain can only be determined by a process similar to that instituted by Mr. Lewis for determining the strength of gear teeth.

Referring to Fig. 7, half sections of an ordinary and a shortened cycloidal rack tooth have been drawn side by side, the proportions being indicated in the figure. The weakest sections to withstand loads normal to the tooth points are at A and B respectively, and the strengths of the teeth are proportional to the lengths x_1 and x_2. By applying this method to large scale drawings of the shortened teeth (for wheels whose number of teeth follow an "equidistant series") Fig. 8 has been determined. By the aid of Fig. 8, in conjunction with the following formula, the correct pitch in order that the teeth may sustain a given load at any determined speed, or conversely the safe load that can be applied to teeth of a given pitch running at a determined pitch line speed, may easily be found:

W = working load at pitch line in pounds.
f = width of face of teeth in inches.
p = circular pitch in inches.
v = pitch line speed, feet per minute.
y = strength factor (derived from Fig. 8)

$$W = 8000\, y f p \left(\frac{600}{v + 600}\right) \text{ for cast iron,}$$

$$= 20000\, y p f \left(\frac{600}{v + 600}\right) \text{ for steel wheels.}$$

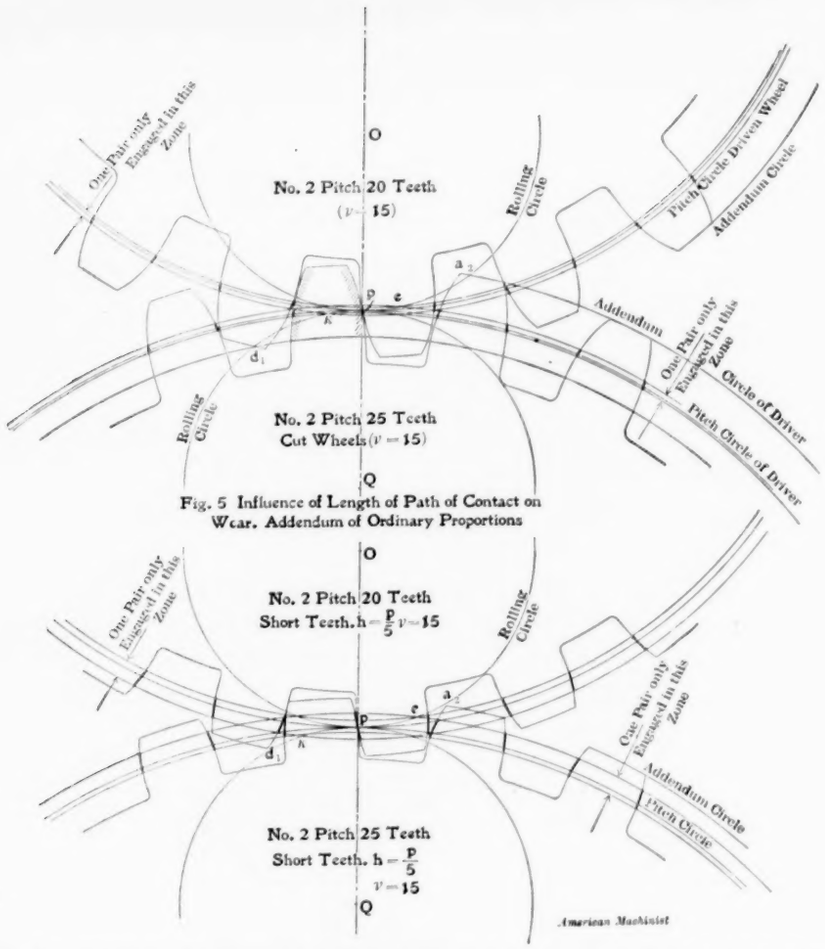

O
No. 2 Pitch 20 Teeth
(v = 15)
One Pair only Engaged in this Zone
Rolling Circle
Pitch Circle Driven Wheel
Addendum Circle
Addendum
Circle of Driver
Pitch Circle of Driver
No. 2 Pitch 25 Teeth
Cut Wheels (v = 15)
Q
Fig. 5 Influence of Length of Path of Contact on Wear. Addendum of Ordinary Proportions
No. 2 Pitch 20 Teeth
Short Teeth. h = p/5 v = 15
No. 2 Pitch 25 Teeth
Short Teeth. h = p/5
v = 15
American Machinist

FIG. 6. INFLUENCE OF LENGTH OF PATH OF CONTACT UPON WEAR, ADDENDUM SHORTENED.

It will be seen that for wheels having a similar number of teeth of the same pitch the gain of strength of the shorter over the normal tooth is about 33 per cent.

This advantage may be utilized in two ways: (1) When the distance between the wheel centers must be reduced to the minimum the number of teeth in the wheels may remain the same as with teeth of the ordinary proportions, the pitch being reduced in the ratio 4 to 3 without decreasing the safe load transmitted; (2) where, as is usual, the center distance between the wheels is already fixed, substitution of the shorter form of tooth permits of reduction of the pitch and increase of the number of the teeth with consequent diminution of friction. In the latter case the legitimate increase in the number of teeth so that the same load may be transmitted may very simply be determined as follows:

If a straight line be drawn from the origin O, Fig. 8, so as to cut each of the curves at points A and C, then for wheels of the same size the scale values of the points of intersection, read on the lower scale, give the number of teeth for wheels of the same strength. Thus a wheel with 46 teeth of the normal proportions will have the same strength as another with 65 teeth with reduced addenda, provided the pitch diameter and speed are maintained the same.*

In order to institute a fair comparison between the two systems, it is necessary to consider the case of two wheels of the same size running at the same speed and under the same load, the pitch and number of teeth being determined as explained.

An actual example will explain the method:

(1) Consider the case of a pair of wheels having ordinary teeth. Number of teeth in driving wheel = 16; number of teeth in driven wheel = 48; pitch number 3; then by Figs. 3 and 4:
the arc of approach = .763 p = .801″,
the arc of recess = .700 p = .732″,
the initial angle of obliquity = 22° 51′,
the terminal angle of obliquity = 21° 3′,
and the load will be transmitted by a single pair of teeth when the point of contact lies between points distant from the pitch point (measured along the contact path) .314″ and .248″.

(2) With shorter teeth (addendum = $\frac{p}{5}$) equal strength is insured if the pitch is reduced to number 4 and the number of teeth may now be altered so as to as

*This follows at once from the consideration that though the pitch of the wheel with short teeth is reduced in the ratio $\frac{OB}{OD}$, the strength factor is increased in the ratio $\frac{CD}{BA}$. Hence since $AB \cdot OD = CD \cdot OB$, we have $\frac{OB}{OD} \cdot \frac{CD}{BA} = 1$; that is to say, the strength is unaltered.

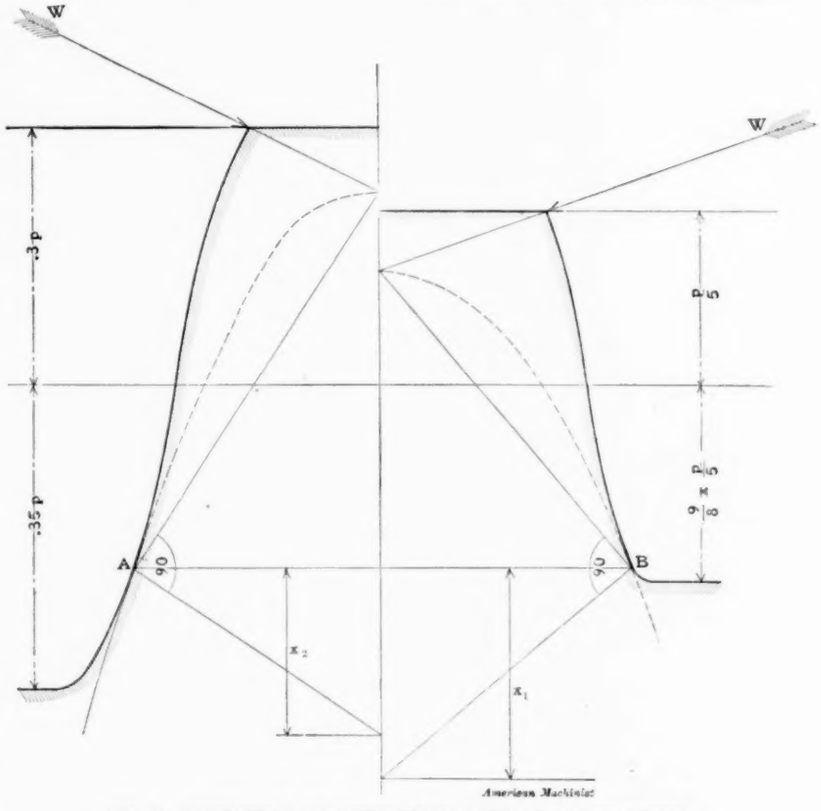


FIG. 7. COMPARISON OF STRENGTH OF LONG AND SHORT TEETH.

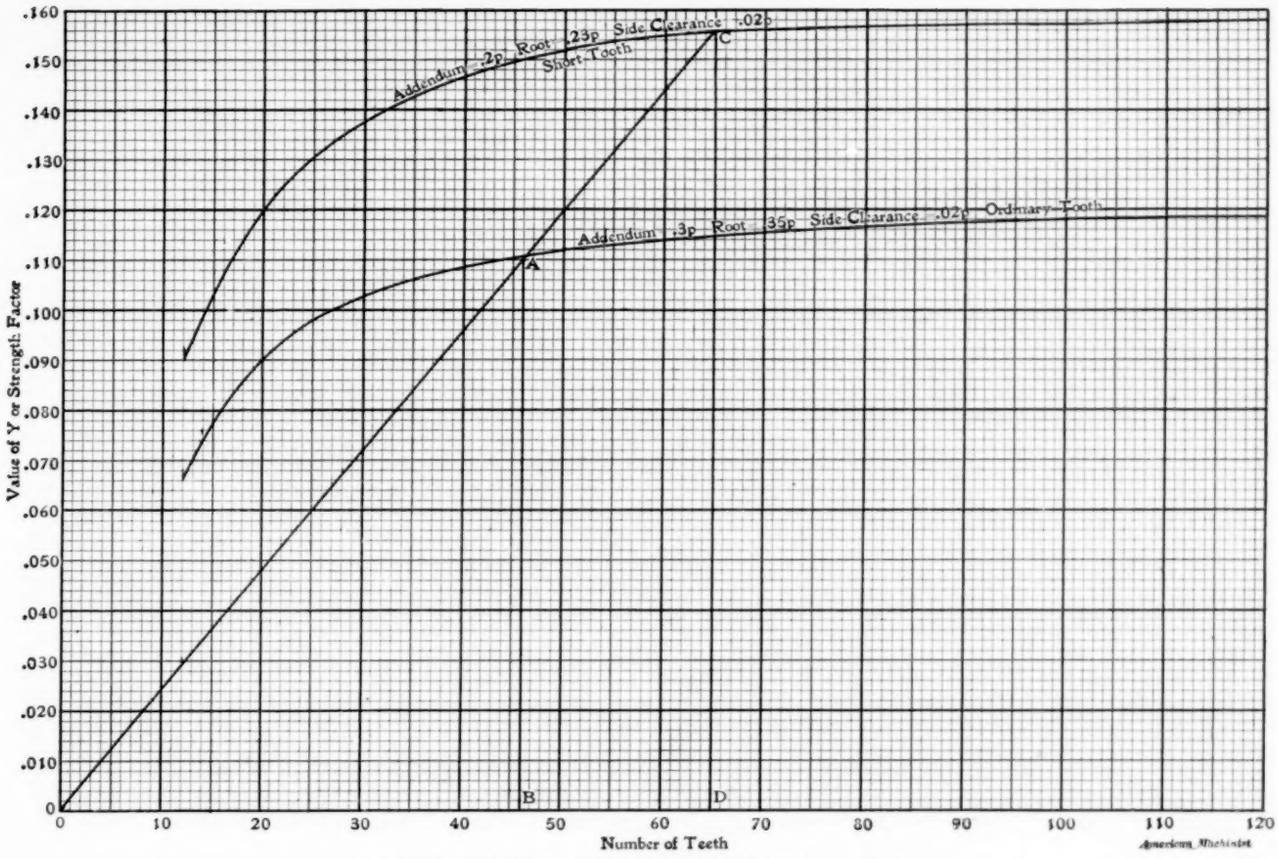


FIG. 8. STRENGTH FACTOR CURVES FOR CYCLOIDAL TEETH.

nearly as possible maintain the size and velocity ratio the same.

Then number of teeth in driving wheel = 21; number of teeth in driven wheel = 64
Then by Fig. 3:
arc of approach = .668 p = .524″,
arc of recess = .561 p = .427″,
and by Fig. 4:
initial angle of obliquity = 18° 9′,
final angle of obliquity = 16° 49′,
and concentration of the whole load on a single pair of teeth is maintained while the point of contact moves between points in the contact path situated .344″ on the approach side and .261″ on the recess side of the pitch point.

The two cases are drawn to the same scale in Fig. 9. It will be seen that the maximum wear at the points of the teeth is greatly reduced in the shorter form, and it is capable of strict demonstration, assuming equal pitch line speeds and loads and equal capacity of the material to resist abrasion, that the reduction of the rolling circle and diminution of the angle of obliquity largely increases the average durability of the teeth.

The advantages of the shorter over the longer form of tooth may be thus summarized:

(1) When the center distance is fixed,
  (*A*) Increased durability,
  (*B*) Increased efficiency,
  (*C*) Greater smoothness of action.
(2) When transmission by gearing is

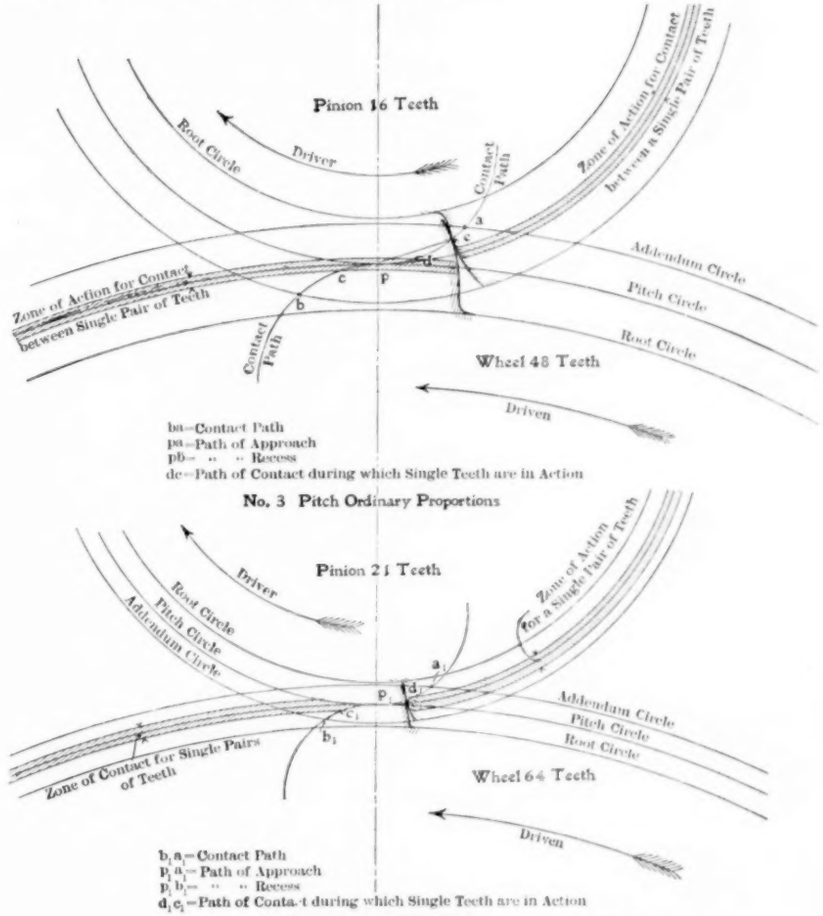


FIG. 9. LONG AND SHORT TEETH OF EQUAL STRENGTH.

required in confined spaces the center distances may be considerably reduced with

(*D*) No loss of durability,

(*E*) A slight gain in efficiency.

New Brompton, England.

Letters from Practical Men

The Suggested Jig Improvement.

Editor American Machinist:

Mr. C. H. Rowe's suggested jig improvement, page 1168, seems to be about right as far as convenience in operating, cleaning, etc., is concerned, but is lacking in the important essential which jigs are supposed to possess, viz.: provisions for retaining the position of the piece to be operated upon, so as to assure accuracy of product. The pressure required to force a 3-16 inch drill through the strip, ⅛ inch thick, ½ inch wide and 6 feet long, supported only near the extreme ends, will cause the center to spring away from the jig more or less, according to the cutting condition of the drill and the amount of pressure applied, thereby causing variation in the distances between holes and the angle of the same to the face of the strip. Until provision is made in Mr. Rowe's jig to prevent the springing as described, I would not consider it as an improvement over Mr. Woodworth's. J. F. C.

Baltimore, Md.

Steel T-squares.

Editor American Machinist:

In answer to the correspondent who has asked for advice from users of T-squares, I beg to say that I had been in the habit of using an ordinary wooden T-square on regular work, but one time I had a job of fine detail to get out, and I became disgusted with what I had to use.

In the first place, the drawing board had shrunk somewhat, and this had split the hardwood strip which was let into the left-hand edge, thus making it untrue. Secondly, the working edge of the blade had become dented from handling. So, having heard of Starrett's appliances, I at once obtained a square and straight-edge side bar, and have found no fault with them during the past seven years. I have not used the Starrett protractor, as I have a Brown & Sharpe instrument, which I prefer on account of its having three edges at right angles, so that it is easy to lay off angles symmetrically about a vertical or horizontal axis.

I find the clamping device on the head of the square a great convenience, as it leaves both hands free to hold the pen and triangle. I have not tried any of the parallel rules which are operated by cords and pulleys at each end, as they seem suited only for larger work than I have needed to do. Henry V. A. Parsell.

Steel T-squares and Triangles.

Editor American Machinist:

I note in your issue No. 43 an inquiry from a fellow draftsman regarding steel T-squares, and as I have been using that kind since 1872—having made the first one that I ever saw—perhaps some of my experience may be of use in helping him to decide the question.

Since the above date I have been the possessor of a 30-inch and a 48-inch square, and have used them to the exclusion of any other kind, although working some of the time where the ordinary wooden ones were furnished.

The steel squares are heavier than wooden ones of the same size and a little harder to move, but they do not shift their positions from the pressure of the pencil or triangle, and the owner never has to go out to the pattern shop to have the edge planed up to get the kinks out.

I use also a set of steel triangles that are as far ahead of the wooden or celluloid angles as are the steel squares.

The steel tools require to be nickel plated, to begin with, and when in constant use require plating over about once in five years; but the satisfaction of having a tool that is true and that can be depended on more than offsets the extra expense.

One other thing that I ought to mention, perhaps, is that if the inquirer is working for an architect, his steel square will not be appreciated by his employer to anything like the extent that it would if his work were with a mechanical engineer. My experience in architects' offices is that anything in the shape of a T-square goes, and a few nicks more or less do not seem to make much difference. I have more than once trued up triangles for them that were out 1-32 inch in 4 inches, and the draftsman never knew it until I called his attention to it on account of his work not matching up at some particular point.

From my past experience I would not be without steel T-squares as long as I can earn the price of one in any way.

H. J. Bingham.

The Accountant's View of Cost Accounting.

Editor American Machinist:

In an article on "The Principles of Cost Accounting," published in your issues Nos. 25 and 26, Mr. Halsey states that "cost-accounting" is "especially and peculiarly within his [the engineer's] province and entirely without the range of bookkeeping as usually understood." In the "Engineering Magazine" of January last Mr. Gunn takes the same ground and claims that "cost-finding is the work of an engineer, supplemented by the best accounting knowledge he can command," and in a foot-note to Mr. Gunn's article the editor refers to "cost-finding" in its broadest sense as a "specialized branch of engineering effort."

With every respect for the authorities quoted, as an accountant I protest against this view of the subject. Assuming that cost-finding, or accounting, is taken in its widest sense—as the science of securing, verifying and recording all details of a manufacturing, productive or operating business—it is a field of accounting, though not, I admit, of "bookkeeping as usually understood." That it is a field the importance of which has perhaps been recognized by engineers before accountants, may be explained by the fact that the advantages to be gained and results obtained directly affect a class of business largely owned and controlled by men reared in the profession of engineering. Firms and corporations engaged in manufacturing, in producing light, heat or power, or in any branch of transportation, are the ones who in these days of close competition may be most helped by a proper system of cost-accounting. Such concerns being more directly under the control of engineers than of accountants, it is a natural result that the former should first appreciate the importance of this subject and give it the attention it deserves, recognizing it may well be a strong force towards success or failure.

If cost-accounting is to be regarded merely as ascertaining the exact cost of material and labor directly expended on a given machine, then perhaps engineering knowledge might obtain more accurate results than an accountant could procure. Labor and material costs are, however, but the most elementary parts of a system of cost-accounting, and if such cost system is, as it should be, one branch of the general plan of accounting—if the results obtained are to supplement and harmonize with the commercial and internal accounts—then the trained accountant (especially the trained cost accountant) will obtain better results, and in a more complete and valuable form. The engineer will see only the results he is obtaining, while the accountant, from the very nature of his profession, will study the consequences of each entry he makes to obtain such results.

That some who have attained the highest position in this field are primarily engineers instead of accountants, does not affect the question. It is, to transpose Mr. Gunn's own words, a result of "accounting work, supplemented by their engineering knowledge." None but accountants, whether by nature or by profession, could have done the work they have accomplished. Kenneth Falconer.

Filing Clippings.

Editor American Machinist:

In a recent issue a correspondent contributes an article on the card system of indexing and a method of filing information.

A plan of considerable convenience is one in which use is made of the Shipman common-sense binder, size about 13x17 inches, accommodating a full-size page of the larger mechanical publications. Fillers of substantial paper, with holes already cut, are inserted. Any article or information to be saved is pasted to the fillers under the classification adopted, and at

the end of a given period of time the articles may be transferred from the binder in constant use to other binders, each being devoted to one chosen classification.

These articles indexed by the ordinary method afford a convenient system for preserving information. J. S. WALKER.

Cutting Square Threaded Screws.

Editor American Machinist:

When I read the article on the above title by Mr. De Leeuw in issue No. 42, I was filled with surprise, alarm and wonder, and then the wonder grew, when I realized the full import of the article. I had always supposed that, on a job of this kind, if the tools were filed up square to within a thousandth or so for clearance, and the job, when finished, screwed together nicely, the threads did fit; and if the tools were set square, with the cutting edge level with the centers, and the cross-slide was fed in at right angles to the axis of screw, the thread must be square.

I never figured on the sides of a square threading tool doing any cutting; in fact, generally guarded against this by making the front of the tool a little wider than the back, something after the manner of a cutting-off tool; and just neglected that negative top rake on the right-hand side and the thin edge on the left-hand side, neither of which does any business. I must confess that I don't quite catch on how any square-nose tool can cut on both sides at the same time when the feeding is done endwise of the tool. This is what Mr. De Leeuw intimates in reference to the first tool.

The third tool, however, will not even make the thread which Mr. De Leeuw imputes to it; that is, it won't if held in the position shown. To show the form of thread this tool would cut, just imagine the screw shown (see Mr. De Leeuw's sketch, page 1161) to be made of putty, and that we had a strip of tin as wide as the tool *I M*. Now, imagine this piece of tin to be pushed down square on the line *I M*, and it is easy to see that it cuts the inner sides of thread on *both* sides, which would make the thread undercut on two sides and concave on the bottom. This is a good chance to impress the fact that any thread tool is a formed tool, and must be held in the proper position whence its form is developed, to cut the proper shape of thread. It does not differ from a forming tool for screw machines in this respect, and most of us know that to get the desired form the tools must be set about right.

If the tool shown were lowered so the right-hand side came down to the axis of screw, this side would cut square, while the left side would be undercut correspondingly more. It is obvious that to make this tool cut a square thread in the position shown, the sides of the tool would have to be made somewhat similar to the Acme thread and the end be convex to fit the bottom of screw. The tool would then cut on the sides also, and it will be seen that lots of different shapes of thread can be cut with the same tool, by changing the vertical adjustment.

I frequently improvised a sort of tap for chasing out odd square or other threads, when the tool had sprung over a hard lump or from any other cause. I just turned up a piece of old iron to slip in the nut and inserted a cutter made of drill rod driven in a hole in the bar. The cutter can be filed up in the bar, then tempered, and when run through the nut a few times with a dog or wrench, will soon do the business. A bushing used the same way will chase down any unevenness in the screw, and when very accurate work on long screws or nuts is desired, such tools take the place of much more costly taps or dies. If much metal is to be removed, it is best to drill a large hole ahead of the tool for the escape of the chips.

GEO. J. MEYER.

Milwaukee, Wis.

Special Drawings for the Pattern Shop.

Editor American Machinist:

I note with interest the memorandum at the conclusion of the article entitled "Keeping Records of Changes in Drawings," in issue No. 43, to the effect that you "have never been able to see the necessity or advantage of making separate drawings for the pattern shop."

No two shops are subject to the same conditions, and, partly for this reason, neither can their conduct of their affairs be administered in the same manner with equal facility and efficiency.

The writer is connected with a business in which thousands of pieces of a kind are manufactured by the use of jigs and special fixtures. Many of the pieces are small, and for economical production in the foundry must be cast from gated patterns. The expansion and pressure of our business have been such that we have been obliged to duplicate and to reduplicate many of these patterns, as well as to replace loss and damage.

Under these conditions we find it advantageous and economical to make special drawings for use in the pattern shop, indicating the exact amount of shrink, draft and finish to be allowed. Instead of sending to our pattern shop a machine drawing of the piece desired and leaving it for the individual patternmaker to decide the amount of allowance to make, the patternmaker's experience and the experience of those who have handled similar castings in the shop are first consulted, and then with the data thus obtained a special drawing is prepared for the pattern; frequently the master pattern dimensions are also added in red or other contrasting color. This practice has been criticised by some as a waste of time, but experience has taught us otherwise.

Uniformity of castings is a prime essential where the said castings must be handled in jigs and fixtures. Satisfactory results cannot be obtained from castings made from different patterns of different sizes and different degrees of shrink and finish. Variations due to indifferent molding are bad enough, but when enhanced by irregularities in the patterns they become vexatious and even intolerable.

Further, we have seen the time when, needing to duplicate an existing pattern and lacking a pattern drawing, we have been obliged to withdraw said pattern from the foundry at a time when badly needed. At such a time a pattern drawing would have been of inestimable value, for instead of interfering with our production in order to have a pattern from which to make our duplicate, we could have had all desired data from the record drawing.

While the writer can conceive no advantage in preparing special pattern drawings for heavy or for medium heavy machines in which material latitude of dimensions may be allowable between cast surfaces, he does believe that in the manufacture of light machines, in large quantities, where castings must be held closely to dimension in order that they may be effectively handled in jigs, the pattern drawing is not only advantageous but essential. X.

[No doubt for the class of work cited, the special pattern drawing is advantageous. The class of work which we had in mind in criticising this practice was general machine construction in which wood patterns are used. Many draftsmen make separate pattern drawings for all such work, and we should be glad to have them give their reasons for doing so.—Ed.]

Stopping Out Tracings for Blueprint Tables.

Editor American Machinist:

One of your readers offers some suggestions about blacking out tracings for blueprinting tables. A more convenient method than blacking a tracing with ink is here suggested, when tables are to be made on blueprints and the squares are wanted white for filling in:

Take a piece of paper that will not print through [yellow or buff paper—Ed.]. Cut it to the size of table required, and perforate the rulings as required with a dressmaker's pattern tracing wheel, placing the paper over three or four thicknesses of blotting paper. The width of the lines may be varied by the pressure on the wheel. After perforating, take a very fine sandpaper and remove the burr from the back side to insure clean holes when printing. Fasten with mucilage or rubber cement, by the corners, to the tracing, and the blueprint will be white with dotted blue lines according to the perforations.

Hartwell, O. C. C. RIGGS.

Mounting Blueprints.

Editor American Machinist:

Perhaps my way of mounting blueprints for shop use might not appeal to Mr. Terry, whose method you published in issue No. 42, but it seems to me to have several advantages over his method. In the first place, prints that have become out of date, owing to changes in the drawing, can be easily cut from the boards and new ones put in their places; second, one of them was never known to warp, all lying as flat as the traditional pancake, and third, it is a much simpler process, as I mount them dry and do not have to put them in a press.

I make the prints an inch or two larger each way than the boards I am to mount them on, and clip the corners down to the size of the boards. Then I fold the margins around to the back side of the boards and fasten the edges down with paste, preferably Higgin's Photo-Mounter. This way also gives protection to the edges of the cardboard and it never frays out at the corners.

E. R. PLAISTED.

"Varnishing Patterns" — Time Cards.

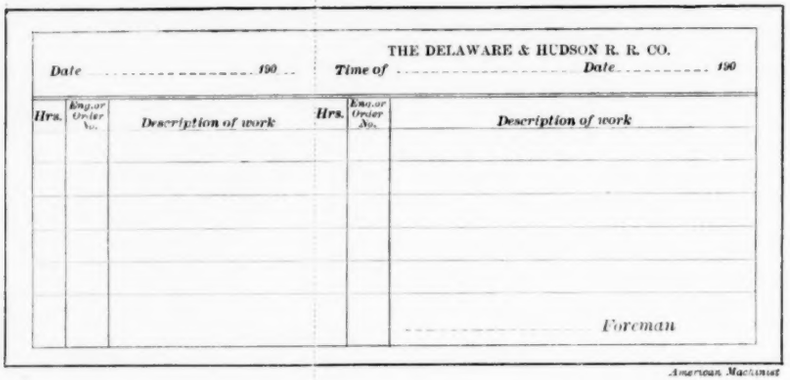
Editor American Machinist:

On page 1144 appears an article on "Varnishing Patterns," by "Patternmaker" which I approached with interest, hoping to find something therein helpful to me; but I was somewhat disappointed. The first of the three reasons assigned for varnishing wooden patterns was to give them a neat and finished appearance. Now, that 's a new idea to me. What I have been led to believe is, that the varnish is impervious to moisture and so prevents the glue from softening if any has been used, that it also fills the pores of the wood, which prevents, in a measure, thin patterns from warping. I often shellac the convex side only of such patterns with two or three coats, allowing it to harden before coating the other side, and usually it does what is desired. With regard to "using it thin," I would say that there is a happy medium, especially for the first coat. It is probable that "Patternmaker" as well as others has at some time applied the first coat so thin that it has made the grain rise and has given the pattern a fuzzy appearance, hence I like to put on the first coat as thick as it will spread easy, and thin for the subsequent coat or coats. "Patternmaker" asserts that as a rule it is a poor workman who prefers black varnish to yellow. Well I am one who does, and I find that all concerned, from pattern shop to foundry, are satisfied. The bodies or principal parts of all patterns and core boxes are varnished black, core prints red, and chill prints yellow. I have several patterns finished that way, having all three colors as above, and their appearance is anything but shabby.

In finishing patterns I proceed as follows: All parts, with the exception of those which are to be finished yellow, I give a first coat of black. When dry, I stop all nail holes and sometimes cover up "bad workmanship" also with beeswax; afterward all is rubbed down with fine sandpaper; then all but the core prints receive another coat of black thinner than the first, and that finishes the black part; then two coats of red are applied to the core prints, and if it is a pattern that has a chill print, that part receives three coats of yellow, making each coat thinner than the previous one.

. . . . . .

From time to time there have appeared in the "American Machinist" specimens of time cards as used by different firms. I send a sketch of one as used by the Delaware & Hudson Company. Each employee receives a book similar to a check book and printed as here shown. The time is entered on the stub as well as on the part detached, with the employee's name. It is deposited in a box for the purpose at the close of each day, and the different foremen sign their names to each, as indicated on sketch. The stubs remain with the employee and may be considered his property.



TIME SLIP AND STUB.

One can readily see how valuable these stubs may become to each man, enabling him to refer to them at any time to see how much time was put on any particular job he may have been engaged in. When the books were first issued there was a lot of kicking by the men—private, of course, but when it was pointed out to some of them that it would be valuable to them to be able to refer to the stubs, enabling them to estimate the time for subsequent jobs, then there was a calm.

WM. NEWTON.

Hydraulic Packings.

Editor American Machinist:

The latter part of Prof. Sweet's article at page 1000 brings up a question that I would like a little information on.

In reference to the relative merits of hemp and cup leather packing for high pressures, will you tell me at what pressure it is advisable to begin the use of cup leathers? The usual practice, I believe, is to use these for pressures of 3,000 pounds and upwards. However, I have seen pump and other stuffing boxes for pressures of 3,000 and 4,000 pounds with plain hemp or other packings. Possibly some of your readers who have had experience on this class of work could give us some light on this subject.

My own experience has been that for pressures up to 1,500 or 2,000 pounds, deep stuffing boxes with good packing are all right, but would like to know if it is safe and good practice to go higher.

STUFFING BOX.

Wants to Come Over and Show us How to Turn the Stone Columns.

Editor American Machinist:

Being a regular subscriber to the "American Machinist," I came across your article, or, rather, the letter of Mr. Tecumseh Swift, on page 1081, on "Wasted Labor." I found it very difficult to accept seriously the statement that stone columns 6 feet in diameter and 54 feet long could not be turned, and that after several failures the job had been abandoned.

Now, sir, is the job still waiting for a man to turn those columns? If it is, I have a great desire to go over to America and do it, and I have not the least doubt that there are many turners in Britain who would be willing to have a go at it. But I offer myself on the "no cure, no pay" system. The conditions are that I shall have an absolutely free hand, that I shall not be overruled by anybody, that I shall have proper tackle provided and that all necessary help shall be given me. My work shall begin when the columns are laid on the bed of the lathe (which I suppose is double-headed) ready to raise into the chucks, and to finish when I have deposited the finished column on the bed of the lathe again ready for the gang to take away. I must have a photograph of the shop, the lathe, lathe foundation and lifting tackle, and must also know the number of columns there are to turn and kind of stone (sample would be necessary) in their composition. Let me have

also the class of finish required and drawing of finished column. Let me have all this, and full specification of contract; and, having received these, I will give my price, and if accepted, I will at once come over and do the job. I am certain I can do it, and the only thing to settle is the dollars. A NORWICH MECHANIC.

[The writer of the above evidently means business, and it is with regret that we assure him that we do not believe that he has the least chance of securing the contract. Notwithstanding the reported ill-success in the case, we believe that there are many American mechanics who could successfully turn the columns, and the job is not really to be regarded as a difficult one. The money that has already been sunk in the enterprise may, however, have barred the way to all further attempts.—Ed.]

The Automobile Exhibition.

The first thing to be said about the Automobile Exhibition in Madison Square Garden is that it is what it purports to be—an exhibition of automobiles and allied things. We recall few or no special exhibitions of this character in which so few things were to be found which did not properly belong there.

Compared with last year's show, perhaps the most important single feature is the relatively smaller display of electric carriages. It would be difficult to say whether steam or gasoline carriages have gained the most, but it is quite certain that, judged by the show alone, the electric carriage has lost ground. It is, however, by no means certain that the show is a certain index in this particular. There are those who say that while a brave showing of electric carriages was made last year the makers of such carriages were in point of fact greatly discouraged over the outlook, their discouragement being due to the excessive weight of the batteries for a reasonable radius of action and to other unsatisfactory features of the batteries. It is right here, however, that the greatest progress has been made in electric carriages during the interim. One such carriage—of the light buggy type—is shown for which a distance of forty miles is claimed and one battery exhibitor claims a distance of no less than 150 miles for a battery weighing 350 pounds when placed in a similar light carriage, while he agrees to insure the maintenance of the battery for five years at an annual charge of 20 per cent. of its cost. There is no doubt that in general there has been marked improvement in this respect, and it is more than possible that, just as the exhibit of electrical carriages a year ago overdid the matter, so the exhibit this year may lead to an underestimate of the real position of that type of carriage.

Of the gasoline carriage the most striking general feature is that they are placed close to the ground, in which feature they form a class by themselves. Horse-drawn vehicles are placed high in order that the occupants may see over the horses. This reason does not pertain to automobiles and mechanical considerations would naturally lead to their being placed as near the ground as is possible. Whether this feature of the gasoline machines is due to considerations of this nature or whether their build in this respect is simply copied from French carriages, which are almost entirely of the gasoline type and which are almost universally low, is not clear, but it is quite certain that the builders of gasoline machines have led in this departure. It is possible, of course, that there are structural features which naturally lead to a lower position of the body in gasoline machines than in others, though the writer does not know of any. In other respects the gasoline machines have many pronounced characteristics, though they do not seem to be related to the fitness of things so clearly as is the low position of the body. Speaking generally, the steam and electric machines are, in their body forms, practically copied from horse-drawn vehicles, while the gasoline machines form a new type. As one believer in the characteristics of the gasoline machines put it: "Last year the exhibition was one of horseless carriages; this year the automobile makes its appearance." Gasoline machines are being fitted with two-cylinder engines to an increasing extent.

In steam carriages the most striking feature is the appearance of wagons for other than pleasure purposes. There are a number of light delivery wagons as well as light omnibuses and one heavy truck. There are also one electric delivery wagon, one electric truck and one small gasoline delivery wagon.

The boilers of the steam machines are, with a single exception, all of the general type first introduced—short vertical shells with numerous fire tubes. The wire-wound copper shell seems to have been abandoned, however, the shells being generally made of seamless drawn steel, and some of the sample shells exhibited are superb pieces of work. Steel disputes the place with copper as a material for the tubes and in some cases the simple expansion of the tubes in the tube sheets is not relied upon. The holes are drilled the size of the tubes and a tap is then run through making a fine and incomplete thread. The tube when rolled is expanded into these threads and its hold on the sheet is obviously much increased. The boilers have also been increased in size—a shell 19x19 inches being now a very common size.

The exception to the fire-tube shell boiler referred to above is a water-tube semi-flash boiler. The tubes are in coils inside a vertical cylindrical containing shell or firebox, outside of which is the shell proper, the annular space between the shells forming the water and steam space. The lower ends of the coils connect with the water body and the upper ends with the steam space. The generation of steam in the tubes leads to an active circulation, water being drawn in below and mixed steam and water being discharged above. The entry of the steam and water into the steam space is tangential, to give the effect of a centrifugal separator, and the steam before going to the engine is passed back through one of the coils which is appropriated for that purpose and which sets as a dryer. The active circulation is claimed to prevent the deposit of sediment in the tubes and the lower end of the water leg, where the motion of the water is stopped by a series of vanes and which is away from the fire, acts as a sediment chamber. Another feature of this boiler is that the exhaust steam is discharged into a chamber having a series of baffle plates which destroys the sound of the exhaust. This chamber is located in the smoke-box where the waste heat is utilized to evaporate its moisture and so make it invisible and through the chamber runs a coil of pipe which acts as a feed water heater. While there is but a single water-tube boiler at the show, one gathers the impression from conversation with exhibitors that the actual tendency in this direction is more pronounced than the single boiler shown would indicate.

The engines of the steam carriages are beginning to be encased, as they should have been long ago. The chain and sprockets are, however, still exposed. Nearly all the engines are fitted with a full-fledged link motion, which looks like a formidable arrangement for such small engines in which the reversing feature is so little used.

In details of construction applicable to all types of carriages the most decided change appears to be in the equalizing gear, in which detail the jack-in-the-box bevel-gear arrangement seems to be giving way to spur-gear equalizers. At last year's exhibition there were but two carriages fitted with spur equalizers and but one manufacturer of them. This year there are from twelve to fifteen carriages fitted with such equalizers and three manufacturers of them.

One hears on every hand that this is a "buyer's show." Last year the results in this respect were very disappointing, but this year the sales are very numerous. One large maker reports himself as sold out till next March. Another sold fifteen carriages in one day and a third finds the outlook so promising that he has raised his price $500 since the show opened. The feeling seems to be that the past year has put the automobile industry on its feet and that next year will bring in a genuine boom. There is, however, a feeling in some quarters that the pleasure carriage feature will prove to be more or less ephemeral and that the ultimate large field for automobiles will be in wagons for business purposes.

Examination for Architectural Draftsman.

The United States Civil Service Commission, Washington, D. C., announces that on December 3, 4 and 5, 1901, an examination will be held in any city in the United States where postal free delivery has been established, for the position of architectural draftsman. The examination will consist of knowledge of building materials and construction and specifications, architectural drawing and design, free-hand drawing, ornament, and orthographic projection, technical education and experience. From the eligibles resulting it is expected that certification will be made to the position of architectural draftsman, Chicago division, Supervising Architect's Office, at $1,200 per annum, and to other similar vacancies as they may occur. Persons who desire to compete should at once apply to the Commission for application forms 304 and 375 and a copy of the Manual of Examinations. The application should be executed and promptly forwarded. The regulations requiring that applications be filed ten days prior to examination will be waived in this case.

Among the recent callers upon President Roosevelt were James O'Connell of the International Association of Machinists, with Messrs. Doran and Reynolds of the Executive Board of the same organization. They called to inform the President that poor work is being done on government contracts in San Francisco owing to the fact that incompetent men have been employed to take the places of members of the International Association of Machinists on strike there.

Personal.

R. S. Windholz, who has been manager of the machinery department of the E. A. Kinsey Company, of Cincinnati, Ohio, and is well known in the machinery trade of that section, will make a change January 1, when he will take a responsible position with the Speed Changing Pulley Company, of Indianapolis, Ind.

Obituary.

James Barclay Henney, recently appointed superintendent of the Manchester (N. H.) Locomotive Works, died suddenly in the office of the works on November 2. Mr. Henney was sixty years old.

Ezra Gould, one of the original partners of the well-known machine-tool firm of Gould & Eberhardt, died at Newark, N. J., November 2, ninety-three years old. Mr. Gould was one of the oldest manufacturers of machine tools, Mr. Eberhardt having been his apprentice. He retired from business ten years ago.

New Corporations.

Coleman Automatic Refrigeration Co.: principal office, Corporation Trust Co., 15 Exchange place, Jersey City; object, manufacturing refrigerating apparatus; capital, $5,000,000. Incorporators: Geo. C. Hall, Arthur S. Dyer, Sidney Aronskin.

The Long Island Motor Co., of Brooklyn, N. Y.; object, building motors, motor vehicles and vessels; capital, $100,000. Directors: Charles Rockliff, A. R. Pardington and F. G. Webb, of Brooklyn.

Universal Automatic Carving Machine Co.; principal office, 525 Main street, East Orange, N. J.; object, manufacturing machinery; capital, $800,000. Incorporators: C. V. Childs, James R. Mapletoft, H. N. Smith.

Manufacturers.

Charles Clarage, Kalamazoo, Mich., will build a new foundry.

Fire has destroyed the lamp works of the J. D. Boyd Company, Trenton, N. J.

The Eastern Bolt & Nut Company is building a factory at East Providence, R. I.

A building will be erected for Hirst & Roger, carpet manufacturers, Philadelphia, Pa.

J. S. Jackson & Son, block manufacturers, Bath, Me., have purchased an additional building.

The Advance Thresher Co., of Battle Creek, Mich., will expend $100,000 in enlarging its plant.

L. J. Clark, Mexico, N. Y., is building an addition to his machine shop and engine works.

Plans are being prepared for a boiler-house for the Lebanon Rolling Mills Company, Lebanon, Pa.

The W. H. Wilmarth Company, Attleboro, Mass., manufacturing jeweler, is about to erect another factory.

The Sessions Foundry Company, Bristol, Conn., will build a 110x100-foot addition to its main building.

S. L. Marble and H. A. Kennison, of Springfield, Mass., propose to erect a shovel handle factory in Maine.

The World Furnishing Company, Ltd., of Orillia, Ont., has let the contract for a new furniture factory.

The Michigan Paint Company, Flint, Mich., is planning to enlarge its plant and build a fine paint factory.

The Sawyer Tool Company, Fitchburg, Mass., has become the "Sawyer Tool Manufacturing Company."

David M. Swain, Stillwater, Minn., has begun the erection of an addition to his foundry and machine shops.

It is understood that the Rochester (N. Y.) & Eastern Railroad Company proposes to establish new shops.

The plant of the Illinois Steel Boiler Works, 713 and 715 Carroll avenue, Chicago, Ill., has been destroyed by fire.

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant; see p. 24.

Punches & dies. Wal.M.Wks.,Waltham,Mass.

Wanted—A Ballou lathe. Box 167, A. M.

Light and fine mach'y to order; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid. J.L.Lucas,Bridgeport,Ct. Send for index sheet.

Mechanical drawing and designing, by experienced man. 1st Floor, 899 N. 41st St., Philadelphia, Pa.

For Sale—One 2 H. P. Shipman kerosene engine; can be seen running; price, $50. Box 1171, Springfield, Mass.

Selden Packing for Stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., New York.

Special tools, models, fine light mach'y and foundry work wanted. Murray Mfg. Co., Richmond Valley, Staten Island, N. Y.

F. J. Stokes Machine Co., 13th and Noble sts., Philadelphia, cut light gears, cams and duplicate small machine parts, in quantities.

Drawings for special machinery, power plants, etc., furnished at reasonable rates by expert draftsman. Box 391, Indianapolis, Ind.

Administrator has for sale, cheap, a machine repair shop, 1 acre of ground and building, in good town of 6,000. H. C. Black, Glen Karn, Ohio.

Small machine shop would like small machine or specialty to build, or machine work of any description to do. P. O. Box 574, Chatham, N. Y.

A young man in Philadelphia, with a thoroughly equipped machine shop, desires to manufacture some specialty. H. Bartol Brazier, 1811 Fitzwater st., Philadelphia, Pa.

High-class machine design and drafting of all kinds done at reasonable rates by a responsible engineering firm; ideas developed; all business confidential. C. & N., care A. M.

Purchaser for small manufacturing plant; lot, 100x180 feet; machine shop, 32x68, two story, with line shaft and gasoline power; foundry, 40x54, new modern equipment; good location; for sale cheap. Hart-Parr Co., Madison, Wis.

The manufacturer and patentee of well-known steam specialties, all brass, wants to combine with reliable firm having brass foundry, or make arrangements for the manufacturing of his steam specialties. Address Box 196, AMERICAN MACHINIST.

A prominent typewriter manufacturing company have just opened a department for the manufacture and sale of novelties. Responsible parties having something of this class to turn out will oblige by addressing "Work," care AMERICAN MACHINIST.

Party with medium size, modern, up-to-date machine shop equipment, that can and will remove to another locality, can learn of an unusually good opportunity to form valuable associations by addressing, with details, "Permanent Business," care AMER. MACHINIST.

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

Information wanted of Christ Pohlman, a machinist by trade, who left San Francisco in or about 1881; had two children, Lizzie and Louis; took boy and left girl with mother, her name being Carrie Pohlman (*nee* Hatch), of New York; last heard from, went to New York. All news regarding him will be thankfully received by his daughter, Lizzie Pohlman, Virginia st., Vallejo, Cal.

Technical graduate with wide business experience, leaving shortly for Europe, well acquainted with the market abroad, desires to secure the handling of some good patents already on the market, or to obtain general agency for Europe of some first-class specialties, or to transact some business proposal of merit; references, guarantees offered. Address M. M. N., care AMERICAN MACHINIST.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisements under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be enclosed to unknown correspondents.

Situations Wanted.

First-class mechanical draftsman is open for engagement. Box 192, AMER. MACH.

Experienced mechanical draftsman wants position. Box 193, AMERICAN MACHINIST.

Premium system expert and cost-keeper would like change of position. Address "Machinist," care AMERICAN MACHINIST.

Mechanical engineer and machine designer desires change; technical man with 8 years' practical experience. Box 136, AM. MACH.

Mechanical engineer, of wide experience in designing and superintending the manufacture of engines, boilers, electrical machinery, etc., is open for engagement. Address Box 194, AMERICAN MACHINIST.

Superintendent or general foreman, machine line. 14 years' varied experience, executive ability, success handling men, now employed, wishes to change; good reasons given. Box 103, AMERICAN MACHINIST.

Position as assistant superintendent, by energetic, practical young man who could divide his time between designing and general assistance about a plant; references. Address Box 102, AMERICAN MACHINIST.

Draftsman, 12 years' experience, technical graduate, wants change; steam engine, copper smelting and general machinery; a leading position only wanted; New York or vicinity. Address Box 105, AMERICAN MACHINIST.

Graduate mechanical draftsman, experienced in construction of pulp and paper mills and pulp and paper machinery, desires permanent position; best references; age 27; married. Address A. J., care AMERICAN MACHINIST.

Position as superintendent or general foreman; am conversant with the machine business in all its branches, a designer of tools, jigs and modern appliances for economical production. Box 163, AMERICAN MACHINIST.

Bookkeeper, age 30, single; thoroughly experienced in manufacturing line; up-to-date methods; all-around man; capable of taking charge of office; exceptional references; salary required, $20 per week. Box 195, AM. M.

Wanted—Position as superintendent or general foreman, by man, 35 years old, of extensive experience on special machinery, gas engine and tool building, at present holding position as superintendent; best of reference. Address "Chicago," care AMERICAN MACHINIST.

Practical superintendent of 15 years' experience; familiar with both methods of manufacturing and contracting shops; capable of handling from 100 to 400 men; familiar with every detail of shop management from the drafting room down; East or Middle States preferred. Address Box 104, AMER. MACH.

Position wanted by a mechanical engineer, 20 years' wide experience, good executive ability, now in a responsible position with large firm who manufacture machinery and tools, and produce work from same upon the interchangeable system; have first-class cost-account system; is open for a position as mechanical engineer, superintendent or manager; the best of reasons for desiring a change; might invest in a growing concern. Box 159, AMERICAN MACHINIST.

Help Wanted.

Machinist wanted at once. The Platte Valley Mfg. Co., 238-240 East 2d St., Fremont, Neb.

Wanted—First-class wood and metal pattern makers. The Goulds Mfg. Co., Seneca Falls, N. Y.

Wanted—Accurate machinist for marine engine work. Apply Ward Engineering Works, Charleston, W. Va.

Wanted—First-class machinists on engine work; no labor trouble. Address Reeves Machine Co., Trenton, N. J.

Wanted—First-class patternmaker; to competent man good wages will be paid. Address Box 197, AMERICAN MACHINIST.

Wanted—Metal patternmakers; state experience and wages expected; good position for right man. Box 154, AMER. MACHINIST.

Draftsman wanted; one familiar with tools for sheet metal work; state experience, age and salary expected. "Brass Goods," care AMERICAN MACHINIST.

Wanted—Experienced man to operate Brown & Sharpe grinder on small tool work; permanent position; state age, experience and wages expected; works near Worcester, Mass. Box 198, AMERICAN MACHINIST.

We are starting a new plant and invite application from first-class wood pattern makers and machinists. Address De Laval Steam Turbine Co., Trenton, N. J.

Good patternmakers, both wood and metal, desiring steady employment, will find it to their advantage to apply to the General Electric Co., Schenectady, N. Y.

Young man with experience in tool making and able to cut dies for embossing artistic articles in sheet metal; moderate wages; steady employment. Address Box 191, AM. MACH.

Wanted—Foreman for a drop forging shop in middle Massachusetts; must be man of experience and ability. Address, giving references, age and experience, Box 100, AM. M.

Wanted—Foreman of drop forging die department in middle Massachusetts; must be man of experience and ability. Address, giving references, age and experience, Box 101, AMERICAN MACHINIST.

Wanted—Draftsman for crane department, with technical education and some experience in hoisting machinery or similar lines. Address, with full details as to qualification, Industrial Works, Bay City, Mich.

Wanted—First-class gas engine painter, competent to take charge of from 30 to 50 painters, and must be thoroughly posted as to fillers, mixing paints and finishing; give experience and wages expected. Address Box 199, AMERICAN MACHINIST.

Wanted—A foreman for about 30 men on small interchangeable work; must be a thoroughly practical man and able to handle men to best advantage; steady position to a man who can get out good work in large quantities. Box 175, AMERICAN MACHINIST.

Wanted—Machinist foreman to take charge of gas engine, searchlight and general electrical work; must be thoroughly competent to handle men and familiar with up-to-date methods; good opening and a chance to grow up with a live business. The Carlisle & Finch Co., Cincinnati, O.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite application from pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

A good mechanical draftsman for out-of-town position; one who who has had experience in designing heavy machinery preferred; applicants will state previous experience, references, age and salary expected. Box 188, AMERICAN MACHINIST.

Wanted—A thoroughly competent and practical draftsman who is familiar with woodworking machinery; one who has had long experience in this particular line of work preferred. Address or call, Room 409, 136 Liberty st., New York City.

Shop superintendent, capable of handling the manufacturing end of a concern employing upwards of 400 men on gas and steam engines, stand pipes and heavy plate work; modern and well-equipped shop. Address Box 153, AMERICAN MACHINIST.

Foreman wanted; man skilled in the most delicate instrument work, such as finest surveying instruments; must have unquestionable proofs of ability to handle very delicate work and to keep at least 20 men employed; reply in full. Box 181, AMER. MACHINIST.

Wanted—Superintendent for foundry and machine shop manufacturing brass fittings for

Wanted.

Automatic Screw Machines and Forming Machines, ranging in sizes up to 3 inches; must be late patterns, in good condition, at a reasonable price.

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A new factory at the south side, Columbus, O., is to be erected by the Columbus Sheet Metal & Iron Company.

The Harrison Safety Boiler Works, Philadelphia, Pa., will add an additional foundry building to their plant.

The Dartmouth Manufacturing Corporation, manufacturer of yarns, New Bedford, Mass., intends to erect an addition.

The Kartavert Manufacturing Company, vulcanized fiber, Wilmington, Del., is having an addition to its plant built.

A portion of the Allis-Chalmers plant at Milwaukee has been damaged by fire, but the loss is comparatively trivial.

The plant of the Alma Portland Cement Company, at Wellston, O., was entirely destroyed by fire a few days ago.

The work of rebuilding the large burned plant of the Reeves Brothers' boiler shops at Alliance, O., has been started.

The Waterous Engine Works Company, St. Paul, Minn., has taken out a permit for the erection of a foundry building.

The corner stone of the Lehigh Portland cement plant at Mitchell, Ind., has been laid. The daily capacity will be 2,200 barrels.

The Barberton Pottery Company, Barberton, O., has been organized by Messrs. H. B. Camp, O. C. Barber and others, of Akron, O.

McClave, Brooks & Co., Scranton, Pa., foundry operators and grate manufacturers, have purchased a 13-acre tract for a new plant.

The Consolidated Ice Company, Pittsburgh, Pa., is preparing to construct another plant, which will have a capacity of 125 tons daily.

Fire at the wall paper factory of the Colin McArthur Company, Montreal, P. Q., has destroyed a quantity of rolling and printing machinery.

Plans have been made for a three-story, 40x50 foot factory building for the Clipper Lawn Mower Company, Incorporated, Norristown, Pa.

The Indiana Brick Company, of Anderson, has purchased 200 acres of land in that city, and is constructing one of the largest brick plants in the West.

A factory building is to be erected on property adjoining the American Stove Board Company's works, Chicago, Ill. It will greatly enlarge their capacity.

Ground has been broken at Ithaca, N. Y., for a $20,000 addition to the plant of the Ithaca Gun Company, which is now 2,000 guns behind orders.

The Wason Manufacturing Company, of Brightwood, Mass., has completed plans for an addition to be used for a car-erecting shop. It will be 75x125 feet.

It is stated at Indianapolis that plans for new shops of the Peoria & Eastern are being prepared in the office of M. A. Neville, engineer of maintenance of way.

The Davenport (Ia.) Spring Vehicle Company has filed articles of incorporation, and with a capital of $50,000 will put up a factory. Isaac Klein is president.

Hubbard & Co., Pittsburgh, Pa., intend adding two 22-inch rolling mills to their plant to supply their own sheets. Their railroad tool department will also be increased.

The West Carnegie Sheet Steel Company has taken over the lately organized Carnegie Sheet Iron Company, Carnegie, Pittsburgh, Pa. A ten-mill sheet plant is to be built.

The Ludowici Roofing Tile Company, Chicago, Ill., has purchased 10 acres of land adjoining its plant, and will erect an additional factory building in the near future.

The Youngstown Engineering Company, Youngstown, O., has secured a contract to build forty barbed wire machines for the Sharon Steel Company, Sharon, Pa.

Plans have been finished for a 35x200-foot building at the Henry Disston & Sons works, Tacony, Philadelphia, Pa., to be used, it is understood, for file-cutting machinery.

Capt. J. M. Brosius will locate a $300,000 no-treadle sewing machine plant at Sheffield, Ala., and is making arrangements to sell the agency for his machine in Canada and Spain.

William Bros., boiler maker and structural iron manufacturer, Minneapolis, Minn., will erect a boiler shop and a power-house, also a structural steel foundry and a machine shop.

The International Cement Company, Pittsburgh, Pa., has under consideration a tract of land near McKeesport, where it will erect its new plant, to have a capacity of 2,000 barrels per day.

The plans for the new plant of the New Castle Bolt & Forge Company, New Castle, Pa., show that the main building will be 60x208 feet, built of brick, together with several other buildings.

Improvements are to be made at the American Biscuit Company building, Third avenue N and Third street, Minneapolis, Minn., which will include the building of an engine and boiler house.

F. H. Bamlet and Wm. D. Southwick, both of Detroit, Mich., accompanied by Theodore Hapke, of New York, a sugar beet expert, have been looking for a location for a factory in Monroe, Mich.

Williamsport, Pa., capitalists are forming a company to manufacture "a journal bearing for all kinds of machinery which does not require any lubricant and operates without the slightest friction."

The Rolling Mill Company of America has been formed by George J. Humbert, of Connellsville, Pa., and a number of New York capitalists, and will erect and operate a sheet mill plant at Connellsville.

The Lloyd Booth plant of the United Engineering & Supply Company, Youngstown, O., is making castings for the new experimental steel car which is to be made by a company recently formed at Youngstown.

Ground is being cleared for the new plant to be erected by the Rolling Mill Company of America at South Connellsville, Pa. It is the intention to go ahead as far as possible with work before the cold weather sets in.

The plant of Dilworth, Porter & Co., Pittsburgh, Pa., was consumed by fire recently. The bar, guide and spike mills are a total loss, together with the machine shop and plate mill. The loss is estimated at $500,000.

The Fischer Foundry & Machine Company, Pittsburgh, Pa., has taken a contract for a complete tube mill outfit, consisting of six furnaces. The contract includes everything except threading and tapping machines.

The Meyer-Neville Hardware Company, of Meridian, Miss., has purchased the Meridian Spoke Factory, and will convert the property into a plant for the manufacture of wagons, wheelbarrows, plow stocks and handles.

Baldwin, Tuthill & Bolton, manufacturers of sawmill machinery, Grand Rapids, Mich., are engaged on extensive improvements to their factory, including the building of a new boiler-room, engine-house and pattern-room.

The American Bridge Company will erect at its Pencoyd plant two buildings, each 800 feet long, together with smaller ones. They will be provided with electric cranes and other machinery of the most up-to-date kind.

H. S. Butler and others at Des Moines, Ia., interested in a patent band cutter and automatic thresher feeder have decided to put in machinery for more extensive manufacture. They have a few machines at 213 Court avenue.

Help Wanted—Continued.

engines and boilers, including injectors and lubricators; want man with experience and executive ability and capable of designing. Address "Injector," care AMER. MACHINIST.

Wanted—A man capable of taking charge of a fan motor department in a large and growing Western factory; also a man capable of taking charge of the detail department in the same factory, making bearing sleeves and dynamo trimmings. Box 131, AMER. MACH.

Tool dresser or blacksmith wanted; one capable of forging and tempering lathe tools in A No. 1 shape, also capable of tempering reamers, forming cutters and mills; only steady, temperate and reliable men need apply; position permanent if satisfactory. Address Box 190, AMERICAN MACHINIST.

Wanted—A competent and energetic draftsman, about 33 to 35 years, up in modern methods, to take charge of small machine shop; good pay to right man; one familiar with bleaching and dyeing machinery preferred. Address, giving full information and wages expected, B. B., 32 Kent st., Somerville, Mass.

Wanted—An experienced mechanical draftsman, between 24 and 30 years of age; one familiar with engines and hoisting machinery required; permanent position with bright future; only a genius and wideawake man need apply; state present occupation and salary desired. Address "Engine," Box 189, A. M.

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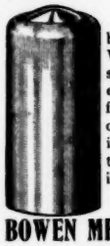

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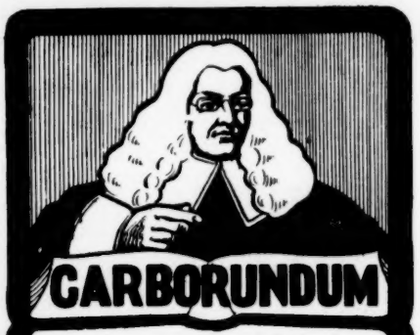

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